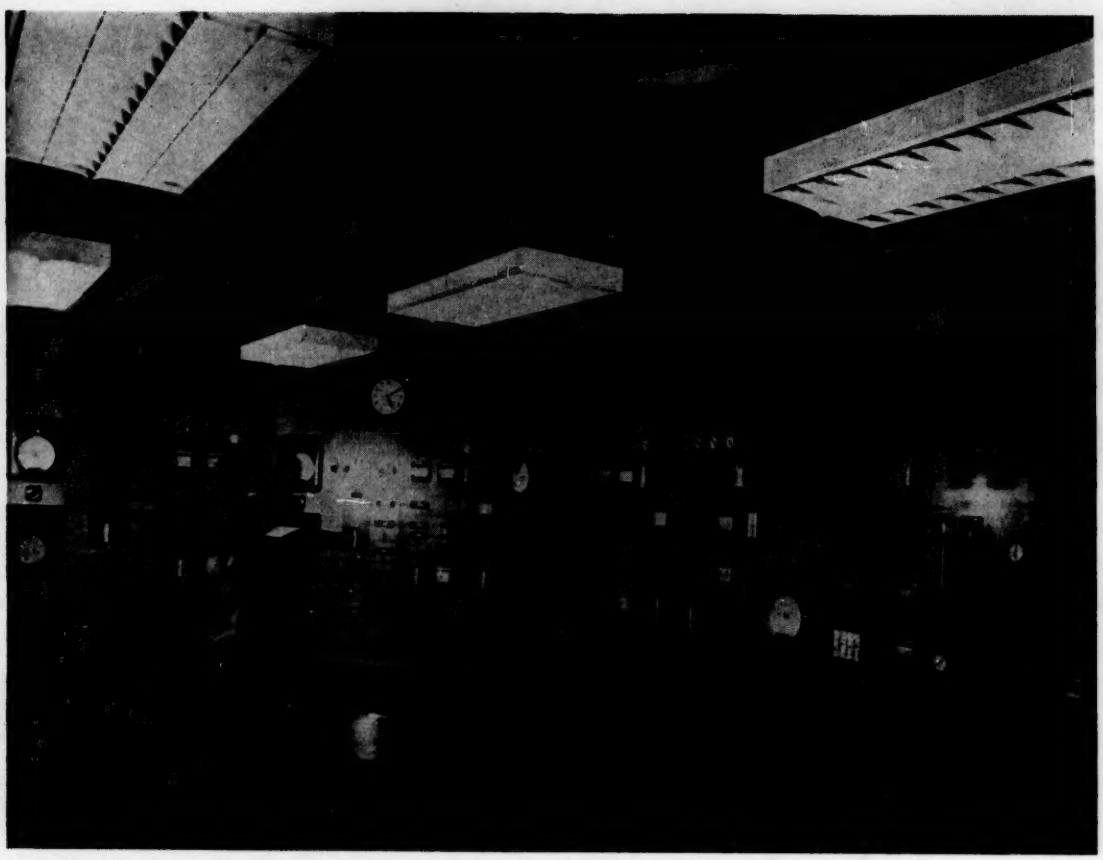
INDUSTRIAL REFRIGERATION

January, 1959

Vol. 136, No. 1



Control Room For Hydrogen Facility At New HumKo Plant, Champaign, Illinois.

Dairy Show Features Improved Refrigeration Equipment Lines Page 5

Non-Condensibles Steal Plant Efficiency, Waste Money Page 12

Private Radiation Research De-Emphasized Page 30

SAVED!

by KRAMER

THERMOBANK COMPRESSOR

your *money!* Kramer's THERMOBANK COMPRESSOR costs less — even less than most so-called "cheap" defrost systems. Many extra components are installed in this package unit, including compressor starter switch, evaporator motor switch, strainer, drier, high and low pressure switches, control box, magnetic starters; sight glass, purge valve, suction vibration eliminator and all service valves.

your *time!* Time saved is money saved. Factory assembled and run-in, THERMOBANK COMPRESSOR is ready to operate. It requires simplest connections between evaporator and compressor package, saving costly installation time. Start-up, control adjustments, and servicing are much easier. Expensive call-backs are eliminated.

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THERMOBANK COMPRESSOR FOR OUTDOOR USE

WRITE FOR BULLETIN TC-406

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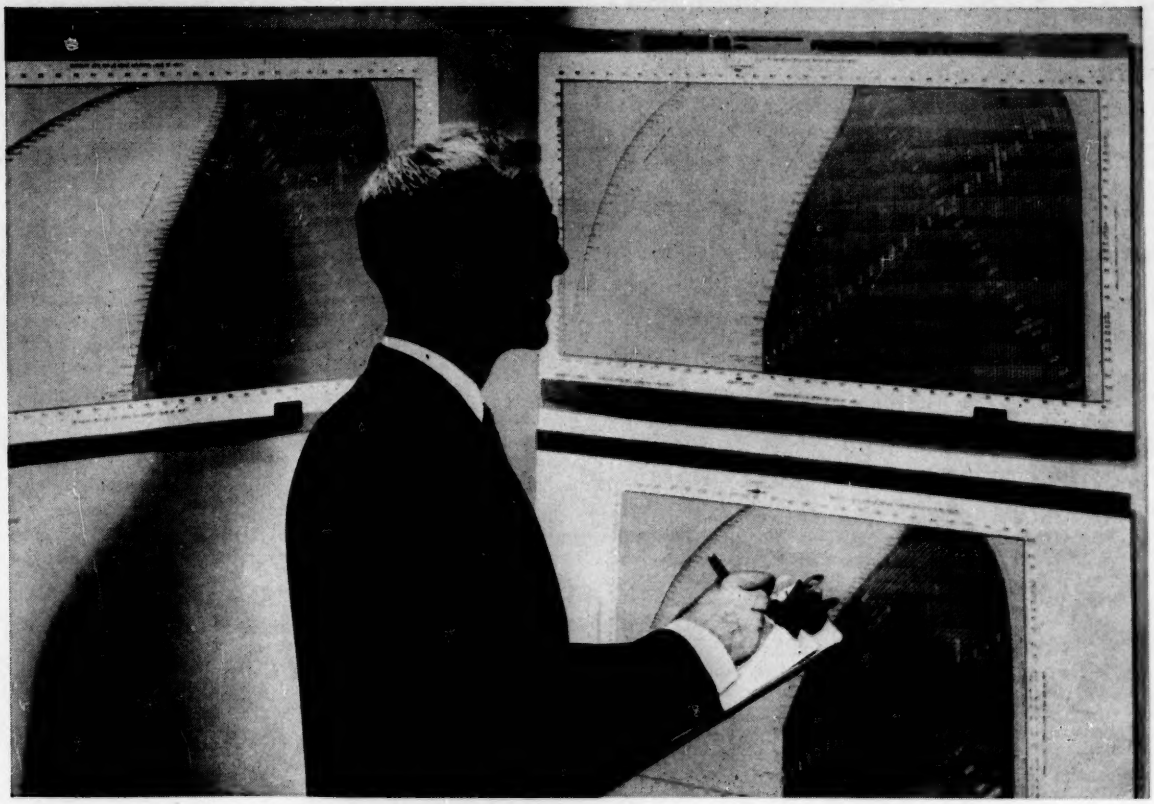
NOW! General Chemical Offers Important New PRESSURE-ENTHALPY WALL CHARTS

...for genetron® Refrigerants 11, 12 and 22



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Convenient To Use!
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For the convenience of refrigeration engineers using thermodynamic data in their work, General Chemical now offers special 5-color pressure-enthalpy wall charts on the three most commonly-used fluorochlorohydrocarbon refrigerants. These large, attractive charts are easier to use than any previously available! They offer all these important advantages:

1. The most extensive range of data ever offered in large chart form.
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Every refrigeration engineer and consultant requiring such data in his work should have a set of these superior pressure-enthalpy diagrams.

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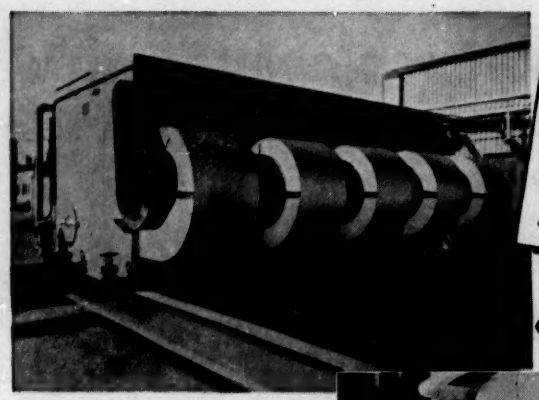
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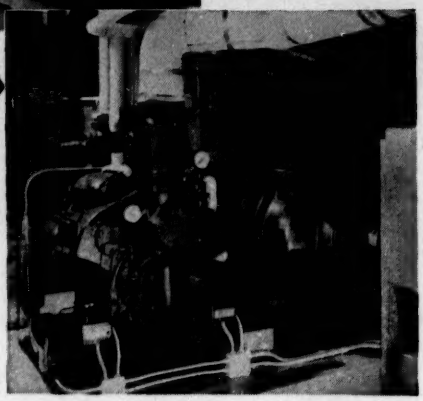
Grade Service Record
A Efficient, alternating zone-load operation.
A Exceptionally low operational cost.
A Uninterrupted air conditioning service.
A Smooth operation with minimum maintenance.

View of the Vilter VXF evaporative condenser located on the roof just outside the compressor room.

View of one of the two Vilter 8-cylinder VMC Freon compressors with a 100 h.p., 1175 r.p.m., part winding motor drive. These compressors are located on an upper floor, above an office.



Cool Thinking ... Cool Fun in Marquette University's

Air Conditioned Brooks Memorial Union

Brooks Memorial Union is the hub of many Marquette University activities—professional meetings and conferences attracting a national audience, exciting school dances, excellent food facilities in the cafeteria, snack bar and private dining rooms. One key to its year-'round popularity and usefulness is the air conditioned comfort provided by the Vilter installation on this Milwaukee Campus.

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Vilter equipment furnished on this job included two 8-cylinder VMC compressors; VXF Freon evaporative condenser; Freon liquid receiver; heat exchanger, cooling coils, motors, and controls.

"Very satisfactory performance with only routine maintenance," is the praiseworthy comment by Marquette University officials.

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Bulletin 631 Vilter Uni-Chiller

Bulletin 820 Vilter VMC Freon Compressors

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January, 1959

Number 1

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news briefs of the month

Industrial Refrigeration

Now in its 67th Year of Publication

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Non-Condensibles: Power Kiters; Refrigerant Wastrels 12
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Milk Industry Conventions Attract 25,000 36
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Ice Industry Activities 38
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THE COVER: Hydrogenation, the process of changing liquid oil to a solid fat, is one of the most important production phases in the manufacture of shortening. HumKo's new Champaign, Illinois plant has its own hydrogen production facilities. Reforming of natural gas, reduction and oxidation by the steam-iron method, and final purification, are controlled from this supervisory and data recording center. Operator is Arthur Longberger.

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NEWS of — Things to Come in INDUSTRIAL REFRIGERATION

February Issue —

▶▶ AIR CONDITIONING, Heating and Ventilating Show late in January at Philadelphia will feature equipment improvements. What's New will carry a description of high-lights.

▶ Backing up the air conditioning theme, IR will feature a paper by Wallace M. Smith, Technical Service, General Chemical Div., Allied Chemical Corp. "Pay Attention to the Details" is the title. Failure to heed instructions resulted in double costs.

▶ Plant Maintenance is the scope of another late show in Cleveland. Consolidating the maintenance theme with the air conditioning interest, IR will bring its readers another feature by John H. Dowling, Fluoro Solvents & Chemicals, Du Pont.

▶ Although air conditioning is a large part of a third feature for February, this interesting story will outline as well meat and bakery applications of refrigeration for the Royal Castle Systems Commissary, Miami, Florida.

March Issue —

▶▶ FROZEN FOOD Packers will meet in Chicago early in March. Just as early in April, the Refrigeration Research Foundation and the National Association of Refrigerated Warehouses will meet in Washington.

▶ Of interest to these groups will be a paper written for IR by Dr. H. C. "Dutch" Diehl. He will summarize how packers and warehousemen, joined now by an increasing number of chain store buyers, are specifying "TTT" conditions at which frozen foods will be shipped, and accepted from transit. Volume sales organizations are designating transport lines which have in their opinion, adequate refrigeration.

▶ Central Grocers at Chicago (a Coop.) recently completed their new distribution center which contains a large frozen food storage and produce coolers. Arguments for owning rather than use of public space is apparently based on direct owner control over personnel, and automation in materials handling, refrigeration.

▶ Stepped up freight schedules cross-country have dictated relocation of icing stations. Sure to follow will be improved equipment for mechanical reefers; especially so in light of tougher frozen food temperature–time–tolerance specs. "Dependable Diesel Power for Mechanically Refrigerated Cars"—a third March feature.

There is a flush plastic door handle and the average size door weighs up

news briefs of the month

Air Conditioning Exposition

Fourteenth International Heating and Air Conditioning Exposition under the auspices of ASHAE will be held at Convention Hall, Philadelphia, Pa. January 26-29, 1959. ASHAE will hold its 65th Annual Meeting concurrently. Meeting will feature seven sessions, with three symposiums on hydronics, heat-pump performance, and corrosion-water treatment.

Poultry Industries At KC in February

Thirtieth Annual Fact Finding Conference of the Poultry Industries will be held at Municipal Auditorium, Kansas City, Mo., February 13-15. Up to the minute reviews of flavor and tenderness of poultry products, discussion of chilling procedures, and presentations on materials handling are among the features in the Processing Workshop. There will be an exhibit of nearly 150 companies concurrently with the Conference.

Alford Constructs Corpus Christi Warehouse

Alford Refrigerated Warehouse, Inc., completed deed papers on Dec. 10 for a million dollar warehouse on a 2½-acre tract of land at Corpus Christi, Texas. Capacity of the new plant is one million cu. ft., with completion dates scheduled for September 15, 1959. Fred Alford, Jr., President of the new Texas Coastal Bend firm is already making his home in Corpus Christi.

International Standardization For Refrigeration Products

Out of the first meeting of the International Standards Organization in London in September, came the news that extensive international standardization is expected in the refrigeration field, with U. S. participation. The U. S. Advisory Committee to ASA on ISO Technical Committee 86 has been given administrative leadership of the working group on the designation of refrigerants, and the sub-committee on testing of factory assembled air conditioning units.

PFE Closes Colton Car Shop

Late in 1958, Pacific Fruit Express Co., subsidiary of the Southern Pacific Railroad Co. announced that building and maintenance of refrigerator cars at the Colton, (Calif.) shops will shut down. Closure of the shop operation there will be gradual with a build up of facilities at Tucson, for the same work by next August. The release did not indicate any change in the icing facilities at Colton, but did indicate a decrease in need for cars in the Colton area and an increasing need for them in the Arizona territory.

Sweden Completes First Ice Skate Rink

The world's first artifically frozen skate racing track is scheduled for completion this month in Gothenburg, Sweden, just in time for the European Championships to be held there on January 31 - February 1. The entire plant will consist of a 400-meter international track 37 feet wide, and two regulation ice hockey rinks. Four 175 hp Refrigerant 22 systems cool a circulating brine solution for freezing and holding the track and rinks. Control systems insure automatic regulation of track temperature to very narrow tolerances, with heat pump application for raising the temperature of the ice in particularly cold weather so as to produce a favored surface. An electric grid is laid beneath the rinks to speed up thawing and drying of the soil when it is desired to play football or tennis on those fields.

FF Quality Research Endorsed By Advisory Group

Refrigerated and Frozen Products Research Advisory Committee, USDA, at its annual meeting in Philadelphia and the District of Columbia late in 1958, encouraged further study in the Time-Temperature-Tolerance areas. USDA's Utilization Research and Development Divisions have done considerable work in this field with mutual cooperation and encouragement of private industries and asociations. Nearly 1½ dozen reports on TTT are now available.

What's New

MACHINERY
APPLIANCES • PROCESSES

▶▶▶ DAIRY INDUSTRIES Exposition, sponsored by the Dairy Industry Supply Association, held at Chicago Navy Pier December 8 through 13, introduced not only a considerable amount of new equipment to that industry, but also a number of improved refrigeration products, supplies and accessories for the entire refrigerating field. Nearly 400 firms had displays, many of the equipment manufacturers having products in actual operation.

Expected were advances in cleaning-in-place, featuring CIP valves, pumps, clamp type fittings and automatic controls, as well as innovations in high speed filling, and new machines able to automatically accumulate and bundle wrap pints and half gallon sizes. However, many refrigeration firms held off the introduction of new ice makers and advanced refrigeration equipment, apparently just for the dairy industry. An aluminum clad air agitated ice builder was one of the prime attractions.

In the commercial refrigeration area were new vending machines accommodating both milk and ice cream in the same display case, soda fountains for outdoor use, home use and in super markets. A great deal of emphasis, of course, went into ice cream truck body building for greater accessibility; new light weight materials and insulations. Walk-in and drop frame bodies were displayed.

Plastic Cold Storage Door

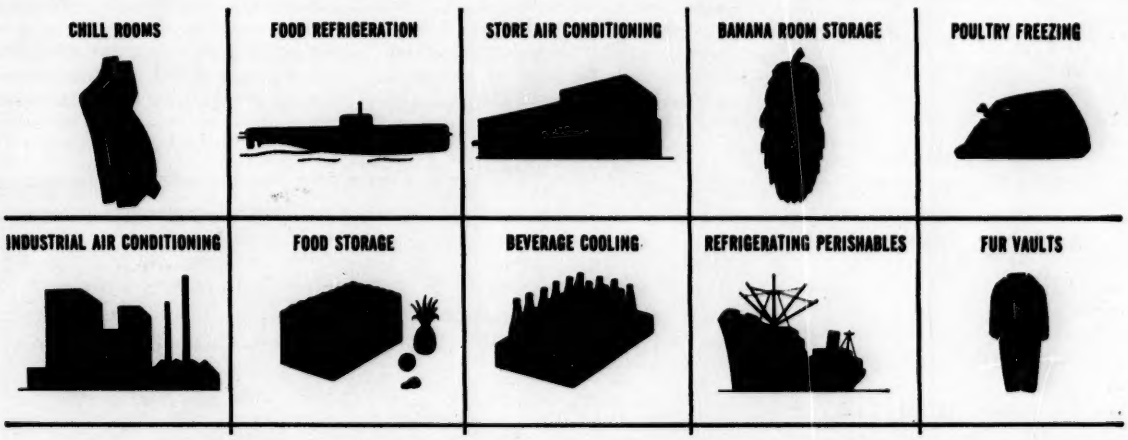
▶ JAMOLITE is the name of a new light weight flush-fitting plastic cold storage door and frame developed by Jamison Cold Storage Door Company, Hagerstown, Maryland. This new accessory which reduces refrigeration loss and clean-up time was introduced for the first time to the public.

Improved sanitation features of the new Jamolite was a prime feature, but of particular importance also were the hermetically sealed construction, the light weight, less bulky and more attractive hardware and improved operating efficiency.

There is a flush plastic door handle and the average size door weighs up to 80 pounds, approximately about one-quarter that of the equally effective metal clad freezer door. Exterior is glass-cloth reinforced polyester plastic, one of the hardest plastic surfaces available. Insulation is foamed-in-place polyurethane foam. Frames are of the same materials as the doors. In addition to the customary range of sizes, the door is available in a range of colors and has a companion line of the vertical sliding package passing and horizontal sliding walk-in doors. Freezer applications can be equipped with Frostop in the frame and sills.

Refrigeration Circulation

▶ COMPLETE information on the installation, operation and maintenance of Phillips Liquid return systems was demonstrated and explained at the Dairy Show. H. A. Phillips & Co. distributed a 12-page manual on the application and selection of both gravity flow and forced flow systems. Detailed specifications to aid refrigeration engineers in the proper installation is included and a trouble shooting chart presents causes and remedies for possible operating problems arising occasionally.



Refrigeration and air conditioning equipment for every need

More and more engineers, contractors and big name users are selecting Krack equipment for these reasons: only Krack manufactures unit coolers with automatic electric defrost that eliminate ceiling frosting . . . circuiting systems that prevent coil "frost-up" and many other products that offer unique performance and installation advantages. In addition, Krack's accurate capacity ratings also save time and trouble . . . eliminate headaches of under-estimating equipment.

For proof . . . send coupon for case histories and Condensed Catalog

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Manufacturers of freon, ammonia, flooded ammonia heat transfer equipment

REFRIGERATION APPLIANCES, Inc., 911 Lake St., Chicago 7, Illinois
Send Free Bulletin 158 giving all technical details and case histories showing how Krack has helped others.

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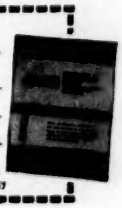
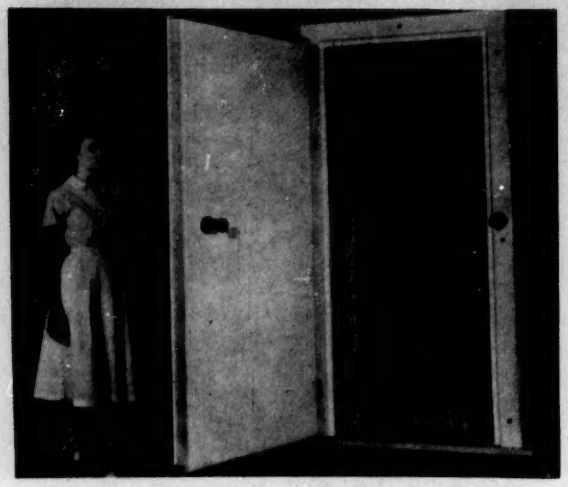
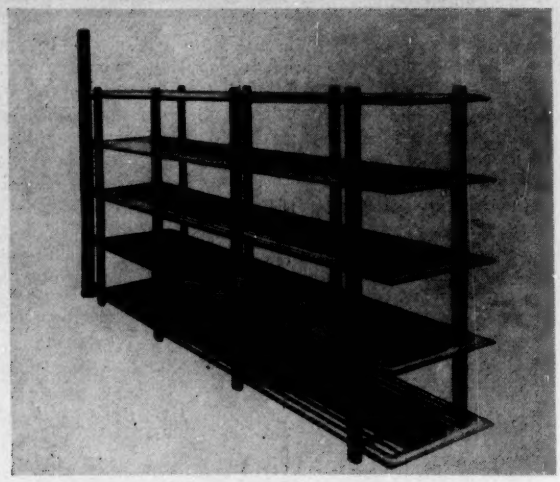


DAIRY SHOW FEATURES IMPROVED LINES



The new Jamolite door of plastic materials.



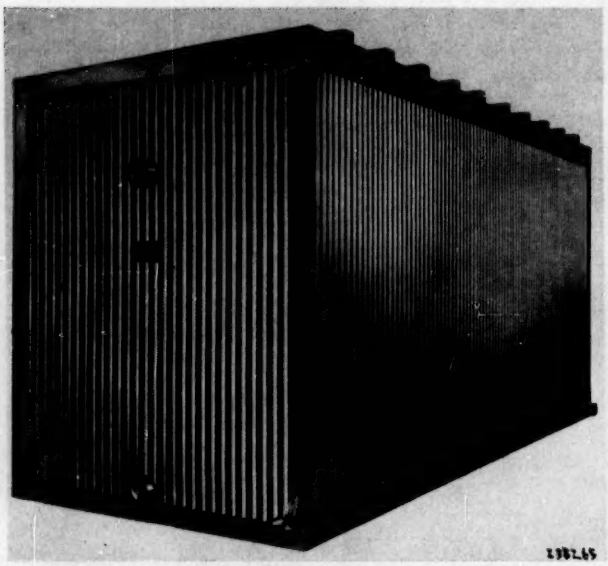
Embossed plate hardening room shelf assembly.

Air Agitated Ice Builders

▶ NEW ICE BUILDERS in 31 different capacities were introduced by the Vilter Manufacturing Co. Units from 1850 through 11,400 pounds capacity are available for Refrigerants 12 and 22 systems. Ammonia refrigerated units range from one to 38½ TR. Refrigerants 12 and 22 operate on a direct expansion principal while the NH_3 units are designed for flooded operation.

Tanks for all models are of heavy steel plate with adequate bracing. Construction is in conformance with U.S. Public Health requirements. Covers are insulated with two inches of Styrofoam. Manufacturer supplies side insulation consisting of 3-in thick polystyrene and two inches of the same material for the bottom. Insulation is covered with an attractive corrugated aluminum sheath. The ice builder is equally suitable for indoor and outdoor installations.

These air agitated ice builders are equipped with low hp positive displacement air blowers. Investigation by the firm has shown that during the ice build-up period, air agitated method of water circulating in the tank tends to produce a clear even formation of ice on the refrigerant coils. Conversely, during the product cooling cycle air agitation effects an even melting of the ice over the entire oil, resulting in a most constant temperature of the outgoing water.



Pleasant appearing exterior of the new Vilter air agitated ice builder is effected by the use of corrugated aluminum and angle forms.

View from the top of the ice builder shows how air agitates water over the face of refrigerant coils for most efficient freezing and thawing.

Shelf Freezing Assembly

▶ INSIDE the ice cream hardening or holding room the old fashioned pipe coil shelves have been replaced with Thermo-Panel coils, manufactured and introduced by a Brooklyn firm. The illustration shows a double embossed type plate. Panel coils may also be obtained with one side flat, giving one smooth face. This type plate coil is known as a single embossed. Such shelf assemblies are not only useful for quick freezing and for holding but may also be applied to drying, heating or cooling various products.

Insulation Makes Displays

▶ NOT SHOWN at the dairy show but suggested nevertheless is a portable display dump manufactured by a Van Nuys, California firm. Called the Frigid-Spot, this portable sales counter is adaptable to many kinds of perishable goods and attracts many customers. It is mounted on a tubular aluminum stand and consists of 2-in. thick planks of Styrofoam for sides and bottom.

Refrigerant for the dumps are either by ice or eutectic containers. In-store tests indicated savings in dry ice costs of 50 percent. Concentrates, meats, pies, desserts, dairy products and produce items have been tested with 20 to 25 pounds of dry ice. Melting time has been more than 24 hours for low temperature foods and more than 30 hours for high temperature items such as dairy products.

Corrosion Resistant Floor

▶ OF COURSE there were other products, supplies and accessories to be seen at the show, and many other companies released information concerning their lines in connection with the annual meetings of the various dairy industry associations. However, this "What's New Column" would not be complete without mentioning floors. Floors in refrigerated spaces take severe abuse constantly. Contributing to this abuse is spillage of various food products which add some acid action to the mechanical wear.

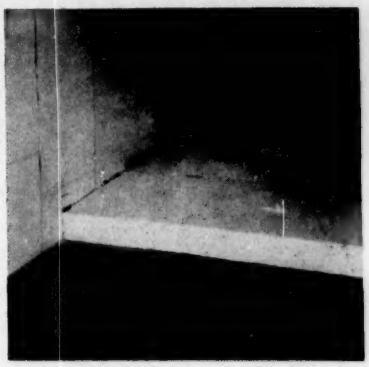
A new flooring material has recently been introduced by a Philadelphia firm which can withstand up to 50 percent inorganic acid conditions without corroding. It will withstand hot concentrated alkaline solutions to 170 F and nitric acids up to 15 percent concentration, as well as being highly resistant to concentrated sulphate solutions. Trowel applied, the product may be used for foot or light truck traffic after five hours. However, it must be applied at non-freezing conditions.

View above shows the semi-trailer used by Armstrong Cork Co., the Hershey Creamery Co., and others in a cooperative reserch effort to produce nearly 100 percent efficient low-temperature transport facility.

Ice Cream Truck Bodies

▶ Released simultaneously with the dairy show, was a 12-page brochure by Armstrong Cork Co., describing the problems of insulating refrigerated cargo trailers and truck bodies. The brochure came closely on the heels of truck trailer test announcements by the National Bureau of Standards, U.S. Department of Commerce and USDA (See INDUSTRIAL REFRIGERATION, December 1958, Page 14). The publication covers in addition to insulation considerations for refrigerated bodies, how air infiltration adds to heat gain, how to stop infiltration and recommended barrier treatment.

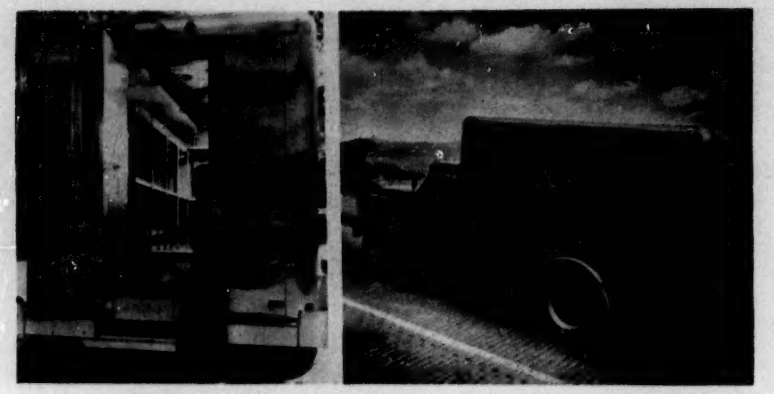
To back up their publication this manufacturer combined efforts with Hackney Brothers Body Co., Kold-Hold Div. and Hershey Creamery Co. The combined research involved construction of a refrigerated trailer body designed to operate at nearly 100 percent thermal efficiency without sacrificing cargo space. A unique sealed envelope vapor barrier was installed to prevent air infiltration. Insulation consisted mostly of Armalite, a foamed polystyrene board. The refrigerating system consisted of two 3-hp Brunner conventional condensing units and ten 30x60x1-in eutectic holdover plates.



Directly above is a construction showing how vapor barrier treatment was effected and the manner in which the Armalite insulation was placed in the floor and side walls.

Below at left is a specialty portable sales counter constructed of Styrofoam which saves on expendable refrigerants.

Directly below is recorded an acid test conducted on a new flooring material introduced recently. Sample at left shows how the material stands up under acid solutions.



Stainless steel makes an attractive refrigerated delivery vehicle.

The 35-ft long trailer had nine of these eutectic plates on the ceiling and the 10th plate mounted on the front wall, the point of greatest heat transfer and infiltration under over-the-road operations. Solution in the plates operates at minus 8 F. Only one door is provided, opening off a small anteroom and the trailer is loaded and unloaded with a built-in conveyor.

Vapor barrier was a polyester film and aluminum foil laminate sealed with polyester tape and adhesive at the joint. Only four inches of insulation was applied, in two layers. The ceiling was insulated with Fiberglas insulation in a large bag constructed of a laminate of polyethylene, aluminum foil and Kraft paper. The edges of the bag were heat sealed together and the polyester laminate in the wall was sealed to the bag. Interior lining was galvanized sheet metal on plywood to the ceiling, corrugated metal placed against plywood for the side and metal floor, all with soldered joints.

Performance tests were made which indicated the trailer had good initial thermal efficiency, essentially eliminated air infiltration and accumulates a very minimum of moisture under high humidity tests. The trailer was subject to 100 F at 65 percent rh for a 3-day period in a controlled temperature and humidity room, being weighed continuously on platform scales. The trailer picked up only 2.8 lbs. of moisture per day, well under the accumulation found in the recent NBS tests. The tests confirmed the design objective of an overall heat gain constant at 39 Btu/hr/F.

Stainless Steel for Delivery Truck Body

▶ ANOTHER TRUCK body builder introduced a stainless steel ice cream delivery unit to the dairy industry. Announced in a release from Allegheny Ludlum for the Dairy Show, this truck employs about 3,000 pounds of the shiny metal. First of four trucks ordered will be delivered to the Dairymen's League Co-Operative Association of New York for use in the Syracuse area. The other three will be used by Penn Dairy of Lancaster to transport ice cream to Philadelphia.

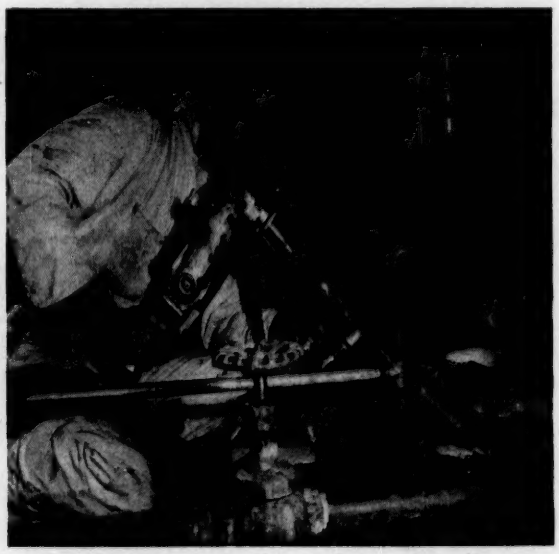
Chairman of the truck body firm indicated that there had long been a corrosive problem with ice cream trucks and recent tests indicated that stainless steel should outlast any other body by two to one. According to that gentleman, ammonia and moisture problem in the handling of ice cream are unusually hard on most metals. It is expected that the stainless steel body will outlast three to four chassis.

Foamed-In-Place Joins Cleaned-In-Place

▶ DAIRY INDUSTRIES were among the first to use methods of cleaning sanitary lines and equipment in place. Now the foamed-in-place insulating method has been applied in the dairy industry. New formulae and machinery for foamed-in-place polyurethane insulation of new or existing structures and transportation equipment, are now being used in the dairy and creamery field on the West Coast.

Recently a major West Coast creamery wished to convert a large room into a refrigerator located between other insulated structural walls. It involved the insulation of a 40x12-ft. wall. Interior finish was excellent with a coved 5-ft tile wall above the floor. Above the tile, the wall was plastered over steel mesh, and both plaster and tile were supported and spaced from the opposite face by 4-in wide open steel "X" studs. To remove the tile and apply insulation by conventional means involved $4,000 and a week's work. Fill insulations were not acceptable.

Partitioned wall 40 feet long was insulated by foamed-in-place methods at a $2,000.00 savings to dairy.



Insulation applicator foams polyuretane insulation into an existing ceiling structure, without disruptions.

Using a portable Stafoamer as illustrated, the wall, (also pictured) was foamed in eight hours, the insulation perfectly bonding to the interior plaster and steel and sealing all cracks and orifices. About 1,000 lb of formulation was used and the entire operation cost $2,000. The firm now plans similar insulation of new ice cream trucks.

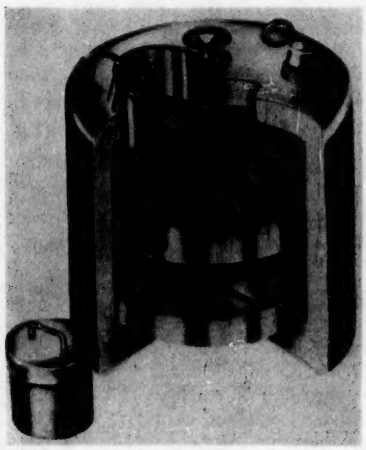
▶ FREEZING Equipment Sales, Inc., have developed a new two-stage compressor consisting of a rotary and a reciprocating unit for which the manufacturer claims high operating efficiency at low suction and high discharge pressures. The compressor is expected to find application in frozen food distribution warehouses and field station ice cream hardening rooms to precool products in storage to offset temperature rises during transfer to the consumer market.

The self contained unit produces 12 TR using Refrigerant 12 from minus 30 deg. F. (5.45 in. vacuum) to a condensing pressure of 110 deg. F. (136 psig.). The rotary compressor receives refrigerant gas from cooling coils or unit cooler from storage rooms and compressed to an intermediate pressure of 20 psig. Discharge gas from the rotary is passed through an intercooler where it is conditioned before entering the high stage reciprocating compressor. The liquid refrigerant from the condenser is precooled in a between-stage intercooler equipped with cooling coils.

No jacket water is necessary; the jacket cooling on the rotary being provided by an oil cooling system with a refrigerant controlled oil cooler.

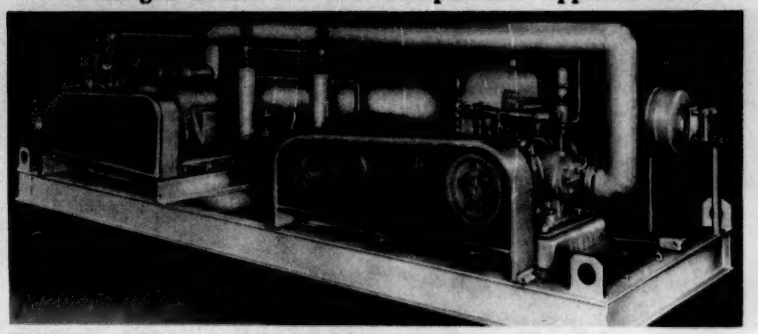
DuPont Color Seals "Freon" Refrigerant

▶ GOLD COLORED hood caps and factory sealed polyethylene valve covers are now being used by DuPont's "Freon" Products Division. A sealed plastic cover placed on the gas discharge valve at the factory assures non-contamination.



Ultra low temperature testing facilitated by this portable non-mechanical refrigerator unit.

Packaged Plants for Low Temperature Applications



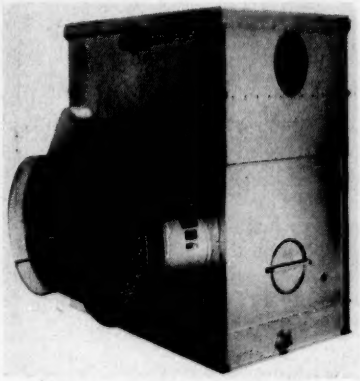
Two-stage multi-temperature self-contained refrigerating plants such as this are available for ice cream and frozen food distribution points.

Low Temperature Non-Mechanical Refrigerator

▶ PROVIDING a storage capacity of 17-1/2 cubic feet of product at temperatures as low as -320°F. and using liquid nitrogen as the refrigerant a new refrigerator is expected to be used for the storage of biologicals, chemicals and metallurgical samples. Constructed entirely of stainless steel, the space between the double walled vessel is drawn to a very high vacuum and according to the manufacturer, a full container of liquid nitrogen will last about 100 days without recharging.

New Cooling Tower

▶ FLEXI-TOWER Manufactured by the Baltimore Aircoil Company, Inc., Baltimore, Maryland is the name chosen to designate a new concept in cooling towers which can be adjusted over a wide range by changing the spray pressure. No mechanical changes, according to the manufacturer, take place in the tower to effect the capacity changes. An increase in pump size is the only mechanical requirement for increased capacity. The tower is a factory-assembled, blow-through, propeller-fan cooling tower with a counterflow design. The unit is of heavy construction with all bolted sections for ease of handling and erection in the field. Moving parts are located externally at working level and access doors provide easy entry to the interior.



Incorporating a variable capacity feature, this steel tower is easily field assembled.

Large Hermetic

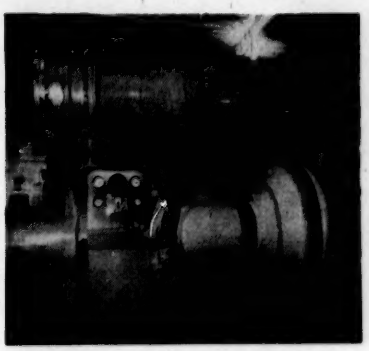
▶ A HERMETIC centrifugal refrigeration machine with a nominal 1500 ton capacity ,said to be the highest available for single compressor units has been added to the line of Carrier equipment. Said to be a major advantage of the new water chiller is the low installation cost per ton of refrigeration capacity because of the minimum of electrical service required, single compressor-motor and starter.

New Foamglas Booklet

▶ A NEW 12-page booklet devoted entirely to the application of FOAMGLAS insulation in low temperature spaces has been published by the Pittsburgh Corning Corporation. The brochure contains photographs and brief descriptions of several new and unusual types of cold storage enclosures made possible by the unique characteristics of the cellular glass insulation. A copy is available from the Pittsburgh Corning Corporation.

Tower Manufacturers Merge

▶ MERGER of Dover Manufacturing Co., Independence, Missouri with J. F. Pritchard & Co. of Calif., Kansas City, Missouri, manufacturers of cooling towers for air conditioning and industrial applications was recently announced and will operate under the name of J. F. Pritchard & Co. of California.



Water chilling for large installations may be more efficiently handled by centrifugal units.

Seven workmen lost their lives in this explosion which was reported and pictured in the March 1958 issue of INDUSTRIAL REFRIGERATION, Page 34.

FEDERAL COURT, RICHMOND DISTRICT AWARDS BLAST DAMAGES TO MERCHANTS

▶▶▶ SEEKING over a half million dollars in damages, The Atlantic Corp. of Atlanta, owners and operators of Merchants Ice and Cold Storage Co., Richmond, contended that leakage from one of the city's two gas mains near the plant caused an explosion last January 16. The city denies that gas was the cause and contends it was the result of an ammonia gas leak from the warehouse's refrigeration system.

After 16 days of testimony, the Federal District Court jury decided that the City of Richmond was at fault and awarded Merchants Ice and Cold Storage Co. $251,000.00 in damages. Another $60,000.00 was awarded to families of the four warehouse workers killed in the explosion. Merchants had asked $611,089.00 including $100,000 on behalf of the families.

Officials of the city's public utilities indicated that the department had no record of when the gas main in question was laid, but news stories indicate there was a gas main in that proximity as far back as 1855. The city did not keep records of gas main installations until 1920.

A fire department batallion chief testified that he was unable to determine the cause of the explosion. The two warehouse witnesses called indicated that there was no odor in the warehouse on the morning of the explosion, but one of them returning to the scene following the explosion testified that he couldn't get close to the building because of the ammonia odor. It was shown that the warehouse does not use natural gas in its own operations.

Expert Witnesses Represent Both Sides

Atlantic Company attorneys based their arguments on a theory that the cause of the explosion was leaking natural gas which had seeped into the building and was set off by an ignition agent undetermined. The city attorneys in defense countered that it was ammonia gas from the warehouse refrigeration system. The explosion occurred in a second floor northwest freezer room of the warehouse.

Atlantic Company hired Jerry A. Burke of Experiment, Inc., a Richmond research firm to determine the cause of the explosion. When a break was discovered in a street gas main located about 20 feet from the warehouse soon after the explosion, the Atlantic Company also hired Emerson Venable, a Pittsburgh chemist, to track down the leaking gas.

Natural Gas Blamed

Venable traced the natural gas to the warehouse foundation walls and Burke presented expert testimony showing how it permeated the walls into the room in which the explosion was said to have taken place. Venable said he found no evidence of gas inside the building but based his conclusion and that of Burke's on past experience with gas explosions. In each instance the walls which had been permeated by the gas were gone.

Sam Tour, a New York City metallurgist, also testified for the warehouse owners after examining samples of the gas main which were brought into court. Pieces of the pipe were taken to a laboratory where they were shaved and physically tested in an attempt to determine the age of the break. The owner's metallurgists said the break occurred from one to three months before the explosion.

Experts for the owners also produced an ancient map of Richmond (obtained from the Library of Congress) which showed a stream crossing the street and looping through a corner of the warehouse. It was through this strata that Venable traced the gas.

Venable also contends that it was gas infiltration which caused the walls to separate like a veneer, and to blow outward when the gas was ignited.

City Experts Differ

Richmond officials employed Ebasco Services of New York. They also employed Walter A. Friend, a New York City nuclear energy consultant. City attorneys and the hired experts contended that the blast was caused by ammonia gas in the warehouse refrigeration system and left the impression that one of the ammonia elements, hydrogen, separated, collected in the refrigeration pipes and was suddenly released by a break in the accumulator. They explained the break in the city gas main as being caused by the explosion, or soon afterward, by vibration from the heavy rescue and salvage equipment used at the scene. The nuclear consultant contended that the blast was a mild one and a city draftsman attempted to show where the stream had previously flowed at some distance from the warehouse.

Jury Instructions

After deliberating 7-1/2 hours, the jurors arrived at their verdict. However, before they were given the case, Judge Albert V. Bryan handed the 12, all male, non Richmond residents, an outline consisting of five questions which they were required to answer. These questions were along following lines:

Does the preponderance of evidence show that gas entering the building from a leak in the city's main to be the cause of the explosion?

If answer to foregoing question is Yes, does a preponderance of evidence show that entry of gas into the building was the result of city negligence?

If answer to the second question is Yes, what amount does the evidence show is fair and just compensation for the families of the deceased employees?

Does the preponderance of the evidence show the Atlantic Co. or Merchants Ice and Cold Storage Co. negligent in any way that contributed to the cause of the explosion?

What amount does the preponderance of the evidence show to be a fair and reasonable damage to reimburse the plantiffs for losses that may have been suffered by them?

Venable Likens Blast To Pittsburgh Explosion

Expert witness Emerson Venable, following the trial told INDUSTRIAL REFRIGERATION, "there is no doubt that the Richmond explosion was caused by gas leaking from the city gas main gaining access to the building through an extended fill area."

"It could not possibly have been caused by an ammonia explosion as was proven by a number of facts brought out in the trial of the case. It was very similar to the City Products Refrigerated Warehouse explosion in Pittsburgh in 1955 which killed one employee and resulted in million dollar damage". Venable investigated both accidents.

By-lined articles and wire services reporting out of Richmond carried the following: " . . . . that the blast might have been caused by nitrogen, one of two components of ammonia. Nitrogen, when properly mixed with air, is highly explosive, they (city employed experts) said". As was clarified by INDUSTRIAL REFRIGERATION later, the experts were referring to the hydrogen component, not nitrogen. Nitrogen is a very stable gas and because of its inertness is used to test refrigerating systems.

Packing House Blast Cause Undetermined

▶▶▶FIRE JITTERY Chicago was shaken Saturday morning, December 5, by another 5-11 alarm when the Reliable Packing Company experienced an explosion on the upper floor of the plant. Damage was estimated at a quarter million dollars. The blast caved in a section of roof over the three-story building. However, various city building and inspection departments cooperated with the firm and the packing company was carrying on business Monday, Dec. 8.

The explosion, still undetermined as to cause, hurled shattered bricks, glass and timber for a half block. Three persons were injured as a result. A watchman who was in the vicinity of the explosion moments earlier, escaped injury when his rounds took him to a lower level. One family close by escaped injury when a glass brick flew through their living room window and rolled into the kitchen. Several cars were smashed by the rubble which blew into the street from the packing house roof. Although ammonia fumes were present when fire fighting equipment arrived on the scene, officials would not, pending complete investigation, attribute the explosion to the refrigeration medium.

Frozen Food Distributors Elect 1959 Officers

▶▶▶REGISTRATIONS at the New York convention of the National Frozen Food Distributors Assn. late in October were up almost 20 percent over last year. Reports indicated that a phenomenal amount of business was written. New officers were elected for 1959.

John T. Kirk, Northern Frozen Foods, Cleveland was elected President. The Secretary is George McRoberts of McRoberts Bros., Inc., Jersey City, N. J. and Howard D. Jester of B. D. Jester, Inc., Wilmington, Del. is the Treasurer. Harry K. Schauffler was again appointed Executive Director and Ellis Arnall is General Counsel. Regional Vice Presidents are: Charles E. Brackett (Eastern); M. C. Corbett (Southern); Byron Nelson (Central); Arthur Boone (Southwestern); E. M. LeBaron (Western).

According to a recent bulletin, one subject stood out in importance at the distributors meeting. It was the matter of functional discounts and the pressing need for them if "the nation's small retailers are to be rescued from the clutches of predatory chains". A vigorous legislative program was promised by Ellis Arnall.

Phil Kuehn, President, NARW, addressed the convention on what the industry must do to put its house in order. Kuehn flung a challenge which was promptly taken up and will be the subject of a presentation in the next year's convention in Chicago, that of refusing to release a product unless it is trucked away in refrigerated equipment.

Refrigerated Biscuits In Multi-Millions

▶▶▶STATISTICS released in November 1958 by a number of government and private agencies indicate that the refrigerated biscuit business will reach an estimated $84,000,000 in retail sales in 1958. In a quarter century, the industry has grown from approximately 17,000 dozen packages to 60,000,000 dozen annually. These figures are based on the year ending June 1, 1958. Estimated sales for the year ending June 1, 1959 shows another 5,000,000 dozen increase in sales. Retail sales in 1933 amounted to approximately $1700.00.

Biscuit Plant for Dallas

▶▶▶SCHEDULED for completion in January is a half million dollar refrigerated biscuit manufacturing plant by Superior Foods, Inc. The new 30,000 sq. ft. white brick building is one of the newest additions to the Brook Hollow Industrial District, Dallas; includes a cold storage warehouse.

Superior Foods will manufacture refrigerated biscuits for resale under private labels as well as advertised brand names. The plant will have a production capacity of 800,000 dozen biscuits per month in both sweet milk and buttermilk varieties.

Frozen Food Processors List Officer Slate

▶▶▶MEETING at their annual convention in New York late in October, the National Prepared Frozen Food Processors Assn. elected Hy Epstein for his second term as president. They embarked on a positive program to enhance the recognition of quality and the distribution of prepared frozen foods. Emphasis in 1959 will be on point-of-sale promotion and trade advertising.

Other officers elected with Epstein were: Nat Friedson, Meat-O-Mat, 1st Vice President; Robert Woods, Quaker Oats Co., 2nd Vice President; Warren Friedman, Mrs. Kornberg's Food Products, Inc., 3rd Vice President; Bernard Zipern, Red L Foods Corp., Treasurer. Epstein is with Milady Food Products, Inc.

NON-CONDENSIBLES: Power

Where and How

By D. D. WILE

Vice President in Charge of Engineering, Recold Corp., D. D. Wile is author of ASRE Data Book chapter on evaporative condensers, co-author on the chapter on psychrometry and a frequent contributor to the technical literature of the refrigeration and air conditioning industry. He twice received ASRE's Wolverine Award.

Graduate of the University of Kentucky College of Engineering, Wile is a registered professional engineer in the State of California. He holds many patents on control devices, refrigeration and air conditioning equipment.

Discussed at the 49th annual meeting of NAPRE in Miami Beach on November 11 was a question that appeared on page 28, July 1958 issue, Industrial Refrigeration. This question read:

"When an automatic purger is used, is a purge connection from both the receiver and condenser required?

"Or, is the large connection from the receiver only, sufficient?"

PURPOSEFUL PURGING

▶▶▶WHERE is an ammonia system purged? From the condenser? From the receiver? From the highest point of the system?

Many systems are operating successfully with purge connections only at the receiver. This is the usual location of the purge on small or moderate size systems. With liberal purging from the receiver, pressures should never rise greatly above normal. On large ammonia systems, however, and especially those under the care of operating engineers, it becomes desirable to purge in the most effective manner possible. The reduction of only a few pounds head pressure can save much power and expense over a period of time.

Judging from the recent correspondence with the NAPRE "Question Box", there are wide differences of opinion on this subject. Possibly the best clue comes from the letter that NAPRE Director Tom Weatherford wrote on June 17:

"It has been my experience that different seasons of the year and different conditions change the best places for purging.

"Also from my past experience, I have found that in the Wintertime you can get some non-condensibles from the receiver, but not always out of the condenser; however, in the Summertime both seem to be about the same."

Gas Behavior

To solve this purging problem it is necessary to understand exactly how air or other non-condensible gases behave inside of an ammonia refrigeration system. Fig. 1 shows an ammonia receiver that contains liquid ammonia, ammonia vapor and air or other non-condensible gas. It would be most convenient if the air crowded up to one end of the receiver, as shown in the diagram, while the ammonia gas kept to the other end. Unfortunately, this just can't happen any more than the nitrogen and oxygen can exist in the atmosphere as separate gases.

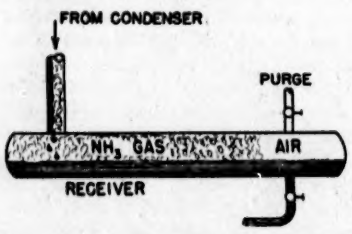


Fig. 1—This can't happen in a refrigeration system. The non-condensible gases will be thoroughly mixed with ammonia. Purging removes ammonia along with the non-condensibles.

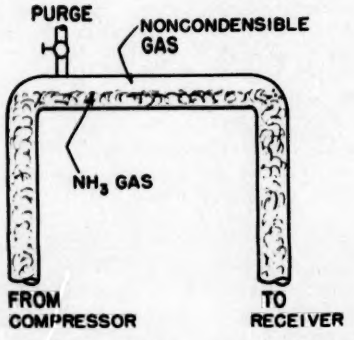


Fig. 2—It would be nice if non-condensibles collected at the high point of a refrigeration system—but this can't happen. A purge at this point is generally useless.

Air and ammonia are always mixed and the presence of air in the receiver must cause an increase in condensing pressure according to the law of gas mixtures. The proportion of air to ammonia vapor is indicated by the relation of condensing pressure to the condensing temperature. If the temperature and pressure in the receiver agree with the ammonia chart, then no air is present. But if the pressure is higher than it should be for the given temperature, then air or other non-condensibles must be present.

The fact that ammonia is mixed with the non-condensible gas causes a great waste of ammonia if purging is done directly to atmosphere without a refrigerated purger. Shown on page 14, Chart I shows amount of NH_3 wasted purging, depending on the temperature. Figures in the chart are based upon a system operating at 184 psig condensing pressure which is equivalent to approximately 96F condensing temperature. To begin with, if the temperature at the receiver happens to be 96F at this condensing pressure of 184 psig, then there would be no air in the system and no need for purging.

Refrigerated Purger Desired

If, however, the temperature of the ammonia in the receiver was 90F with a presure of 184 psig, there would be one cubic foot of air for each 11.3 cubic feet of ammonia gas in the receiver. Purging to atmosphere would then waste 11.3 cubic feet of ammonia for each cubic foot of air purged.

(Continued on Page 14)

Kiters; Refrigerant Wastrels

to Remove Them

Two prominent refrigeration figures had submitted the question jointly. They were Thomas H. Rea, Armstrong Machine Works, Three Rivers, Mich. and Daniel W. Wile, Recold Corp., Los Angeles, Calif. Many answers were received —too many for publication and many in disagreement. A few were summarized and printed. However, as a result the NAPRE Education Committee asked these two figures to present their views in this at a recent national forum.

Wisconsin born Thomas H. Rea graduated from Grand Rapids, Michigan, Union High School, The U. S. Navy in World War I, and from Oberlin College. Experiences at Goodyear Tire and Rubber Company, White Motor Car Co., and Eddy Paper Corp. preceded his joining the Armstrong Steam Trap Co. in 1927.

His position as Sales Manager has given him experience with steam trap engineering problems in a wide variety of industrial plants. The use of traps as refrigerant seals and expansion valves led directly to the development of the Armstrong Purger.

By T. H. REA

PURGE CONNECTIONS

▶▶▶ TOP-NOTCH refrigeration men with years of practical experience replied to the question outlined at center of this spread. Much to the author's surprise at least, there is a wide difference of opinion. The score:

Six engineers say purge from the receiver only where ammonia is the refrigerant.

Nine want purge connections from both the condenser and receiver. However, three of these engineers added that condenser purge connections were required only under certain conditions.

Four men (and this really was surprising) expressed a preference for just a condenser purge connection. Two of these men specifically referred to Refrigerant 12 systems. Of the other two with ammonia systems, one actually had purge connections on both his receiver and all five condensers. He wrote that 95 per cent of non-condensibles are purged from the top of his No. 1 condenser.

If the above capsule summary of replies is insufficient to prove diversity of opinion, consider this quote from one contributor who put it this way: "I tried bringing this question up for discussion at our last NAPRE meeting . . . and got almost as many opinions as we had contributors".

Ground Rules

In the following discussion of purging and purge connections, it is desired to emphasize the point that we are dealing with connections for automatic purging—which means purging with the compressor in operation. The purge connections for automatic purging are not necessarily the same as purge connections that are used only after the compressor has been shut down. Also, considerations are with purger installation on refrigerating systems as they are, rather than as they should be.

Reasons For Purging

Refrigeration systems are purged to keep air and other non-condensible gases from interfering with heat transfer in the condenser and thereby raising head pressure, with consequent increase in power costs and decrease in compressor capacity. Why non-condensibles in a condenser causes head pressure to go up is apparent from Fig. 1, which shows a conventional horizontal shell and tube condenser, plus the liquid receiver to which it drains. The cross-hatch-

(Continued on Page 15)

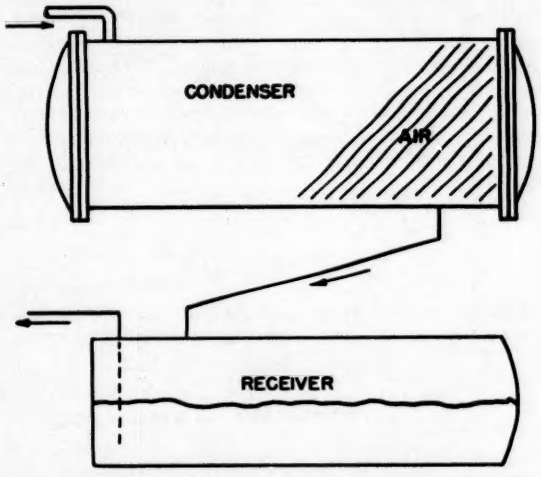


Fig. 1—Non-condensibles such as air trapped in the condenser raises head pressure; raises power consumption.

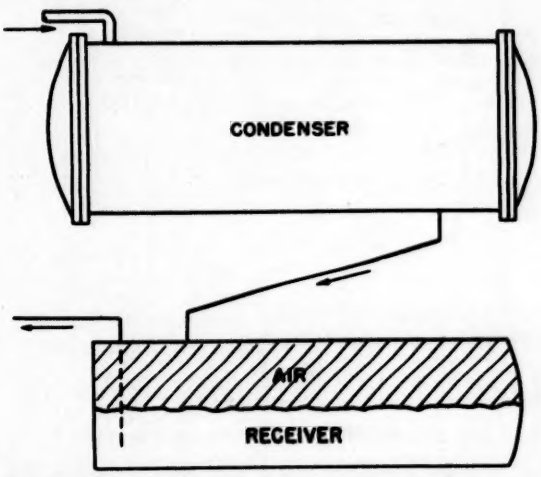
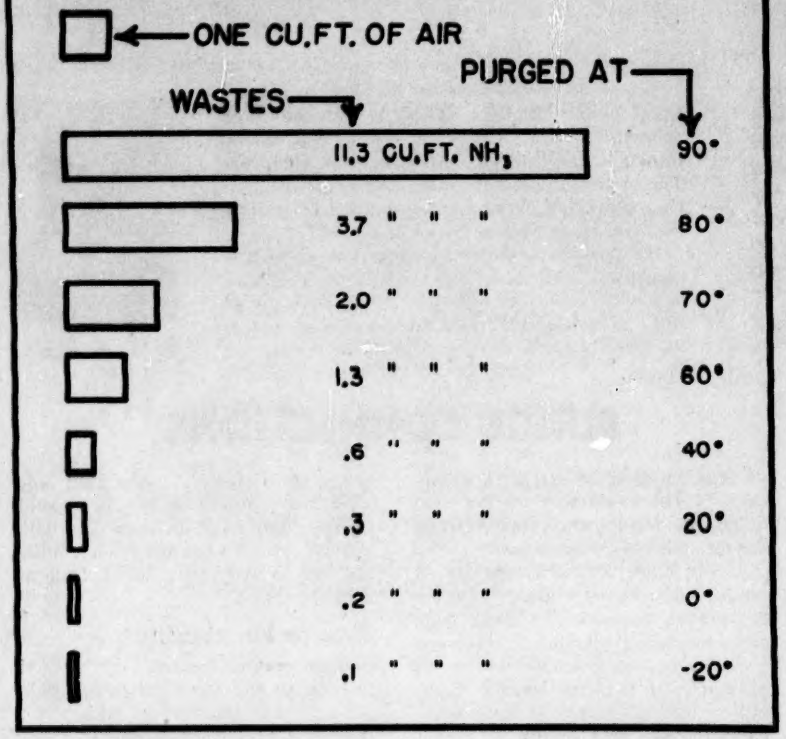


Fig. 2—Air in refrigerant receiver only has no effect on head pressure, according to the manufacturer.

CHART 1—Amount of ammonia wasted when purging non-condensibles depends on the temperature at the purger. Figures given here are for a system operating at 184 psig condensing pressure.



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By merely discharging into a purger cooled by water to 70F, we could reduce the ammonia loss to only two cu ft/cu ft of air, which is 90F. Refrigerate the purger to 20F and this loss would decrease to three-tenths cu. ft NH_3/cu ft air, or less than 3 per cent of the loss at 90F.

Thus it is easy to see why the refrigerated purger is so important on large systems, and especially on systems that operate below atmospheric pressure with the possibility of air drawing into the system.

Refutes "High-Point" Theory

Return now to the system itself to see if there is any one place that is best for purging. At some time or other all engineers have heard about purging from the "high point" of the system. It would be nice if air or other non-condensibles collected at the high point (as shown in Fig. 2), but such is not the case.

If it were possible for air and ammonia vapor to exist in the system separately, then the air, being heavier than ammonia, would settle to a low point rather than a high point. Actually, non-condensible gases are thoroughly diffused with the ammonia and there is no logical reason for purging at the high point. Many systems are equipped with purge valves at the high point, but the experienced engineer soon finds that he must purge from some other place.

Cool Location For Receiver

Fig. 3 shows the high pressure side of the system with purge valve only at the receiver. This is a good arrangement if the receiver is located in a cool place. The receiver then acts as condensing surface and draws in ammonia vapor along with the liquid. The flow of ammonia vapor into the receiver will carry air and non-

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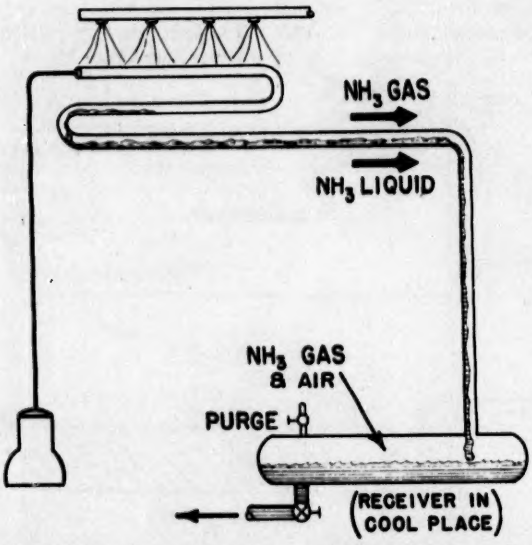

Fig. 3—When a receiver is in a cool place there is a flow of ammonia gas into the receiver. This flow carries non-condensibles to the receiver where they can be purged.

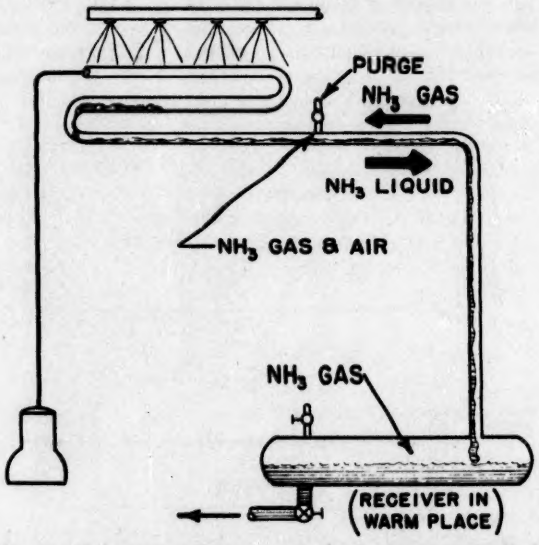

Fig. 4—With receiver in a warm place, some ammonia is re-evaporated and the vapor flows back to the condenser. Non-condensibles collecting near the condenser outlet should be purged there.

(Continued From Page 13)

ing indicates an accumulation of air at one end of the condenser. This non-condensible interferes with heat transfer through the tubes. The heat load, therefore, has to be handled by the tubes that are free from air.

Fig. 2 shows the same condenser and receiver system as Fig. 1, except in this case the non-condensibles are in the receiver. There is no air in the condenser to interfere with heat transfer. Therefore, the condenser will operate at peak efficiency, and there will be no increase in head pressure even though there is air in the high side of the system.

Refrigerated Purger Developed From Traps

Comments that follow on automatic purging and location of purge connections will, perhaps, be more clear if operation of an automatic refrigerated purger is explained. If this were a TV program, this part of the presentation would be called a "commercial", and if the reader goes to the kitchen to grab a beer, he will be forgiven—provided he returns to this work.) An Armstrong Purger is a combination of an inverted bucket steam trap and a ball float air relief trap, plus means for refrigerating the assembly (see Fig. 3).

Consider an Armstrong Inverted Bucket Trap. Gases pass through the vent in the top of the bucket. In steam applications, steam bubbles will condense to make up for radiation loss from the trap. Air bubbles cannot condense. So, air collects at the top of the trap. This air displaces water which then enters the bucket, causing it to open the valve, and the accumulated air is discharged ahead of the condensate.

Armstrong also makes a ball float Air Relief Trap. The liquid lifts the float to close the discharge valve. If air enters the trap from the bottom, it will displace liquid. As the liquid level drops, the float loses buoyancy until it opens the valve and vents the incoming air.

Together, the Inverted Bucket Trap and the Ball Float Trap form an Armstrong Purger. At the bottom is an inverted bucket steam trap mechanism. At the top, an air relief trap mechanism. Also, in the top is a coil to chill the liquid in the purger.

Detailed Functions

A mixture of ammonia and non-condensibles from the receiver enters the purger at the bottom. Picture the purger with the inverted bucket holding the liquid discharge valve closed. Air and NH_3 gas pass through the bucket vent. The NH_3 gas immediately condenses because it is at high side pressure and close to low side temperature. Of course, the air can't condense, so it rises to the top of the purger. Accumulating air depresses the liquid level until the float sinks slightly to open the air vent valve, and out goes the air. The displaced liquid enters the bucket which sinks to discharge the condensed NH_3 to the liquid line.

This discharged liquid passes through expansion valve serving the purger coil, to provide the refrigerating effect. Thus, the air that enters the purger is vented to the atmosphere while the NH3 is condensed and returns to the compressor.

Flow of gas to the purger automatically is controlled by the size of the vent in the inverted bucket. Venting of air also is automatically controlled by the air valve float. The only valve requiring manual adjustment is the expansion valve, and this can be automated by a thermo valve. When all non-condensibles are purged, NH_3 gas entering the purger will be condensed 100 percent.

Assume an automatic purger with connections at both the receiver and condenser. In operating such an automatic purger, seldom will the operator experience removal of non-condensibles from the condenser; most of the time he will get air from the receiver. This does not prove, how ever, that there is never any air in the condenser. The purge connection may not be correctly located.

Purge Connections

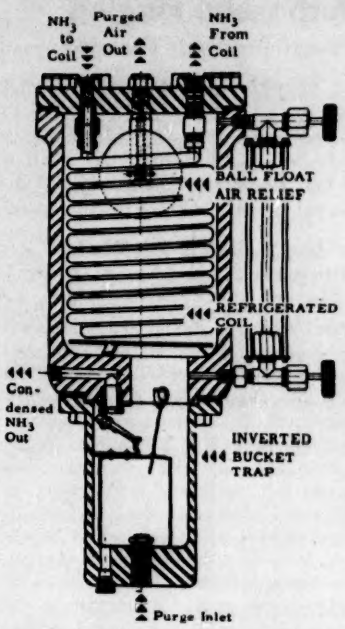

Fig. 3—Armstrong purger consists of steam accessories, plus refrigerated coil for NH_3 condensing.

Spot Selection

An outstanding example of the importance of condenser purge connection is shown in Fig. 4, a combination condenser and receiver of a 300-ton ammonia air conditioning system. At first, the purge connection was made at point "X", with no removal of non-condensibles. Then, the purge was switched to point "Y". Still, no air removal. Since points "X" and "Y" were considerably removed from the cooling water inlet, it was reasoned that air was building up at the coldest point of the system.

Next step was to take pyrometer readings on the surface of the condenser-receiver, as shown in Fig. 5. Surface temperatures ranged from a high of 180 F at the gas inlet to a low of 110 F next to the water inlet. Temperatures at the two unsuccessful purge points were 150 F and 145 F respectively. The coldest temperature, 110 F, was too close to the

(Continued on Page 17)

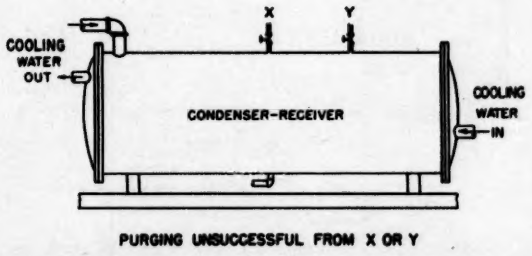

Fig. 4—Purging was unsuccessful from connections "X" or "Y" in this 300 TR air conditioning installation.

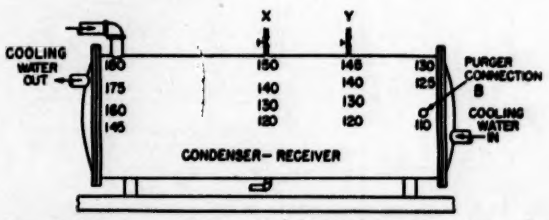

Fig. 5—Correct purging point of Fig. 2 equipment was located by pyrometer readings taken on the shell.

Purposeful Purging

(Continued From Page 14)

condensible gases along with it and the purge at the receiver will be effective and adequate. This condition exists especially during cold weather if the receiver is located in an unheated or only slightly heated space.

Warm Location Emphasizes Adequate Sized Liquid Drain

If the receiver is located in a warm space, as shown in Fig. 4, then some ammonia will be re-evaporated in the receiver and will increase the head pressure unless the vapor can flow back to the condenser and be re-condensed. This is why it is so important to have the connection between the condenser and receiver of adequate size and free from any traps or obstructions. The flow of vapor from the receiver back to the condenser will concentrate the non-condensibles in the lower part of the condenser and it becomes desirable to purge at the outlet of the condenser. This is the condition that will exist on most installations during warm weather.

Thus a plant has a situation where the non-condensibles may collect in the receiver or the condenser, depending upon whether the receiver is in a cool or warm place in relation to the condensing temperature. This explains why Tom Weatherford has found non-condensibles in the receiver during the Wintertime and in the condenser during the Summertime.

If, during warm weather, the non-condensibles are concentrated in the lower part of the condenser, how can a purge at the receiver do any good at all? The answer is, that with non-condensibles present, the temperature of the refrigerant in the lower tubes of the condenser becomes subcooled below the condensing temperature. This subcooled liquid lowers the temperature of the receiver below room temperature. A portion of the non-condensibles will then flow to the receiver and, by heavy purging, can be removed at that point. Some non-condensibles will usually be left in the condenser and head pressure will be somewhat higher than if the non-condensibles had been purged at the condenser outlet.

Some engineers have placed much emphasis on locating the purge valve at the end of the receiver, away from the inlet. On long, narrow receivers, the flow of ammonia vapor into the receiver might tend to concentrate non-condensibles at the far end of the receiver. But this trend would be very slight and can only happen when the receiver is in a space that is cooler than the condensing temperature. If you purge from a receiver located in a space warmer than the condensing temperature, it would be better to have the purge connection near the inlet connection. From a practical viewpoint, it doesn't make a great difference where, on the receiver, the connection is located.

Proper Venting

It sometimes happens that the connection from the evaporative condenser to the receiver is excessively long or has been installed in a manner to cause trapping of the liquid ammonia as shown in Fig. 5. This condition will cause high head pressure if the receiver is located in a warm space and no amount of purging will correct it. The solution is to install the line properly, or to install an equalizer line from the outlet of the condenser to the receiver (see Fig. 5).

An equalizer line must be of adequate size to permit the flow of warm gas back to the condenser and must be free of traps. It should have a positive drain towards either the condenser or the receiver, or from a central high point to both the condenser and the receiver. Purging should be from the outlet of the condenser or from the receiver depending on whether the receiver is warmer or cooler than the condensing temperature.

Fig. 6 shows a method of connecting an "equalizer" line in an evaporative condenser system that is sure to give trouble. Hot gas will flow through this equalizer line and short-circuit the condenser. Liquid refrigerant will load up in the condenser and reduce its capacity. The author's firm recently encountered a system installed as shown in Fig. 6. It had operated for many months with excessively high head pressure. There were two compressors on this system and it seemed to make little difference whether one or both compressors were operating. The head pressure was always high. The situation was corrected by merely cutting the equalizer connection out and purging from the receiver.

(Continued on Page 32)

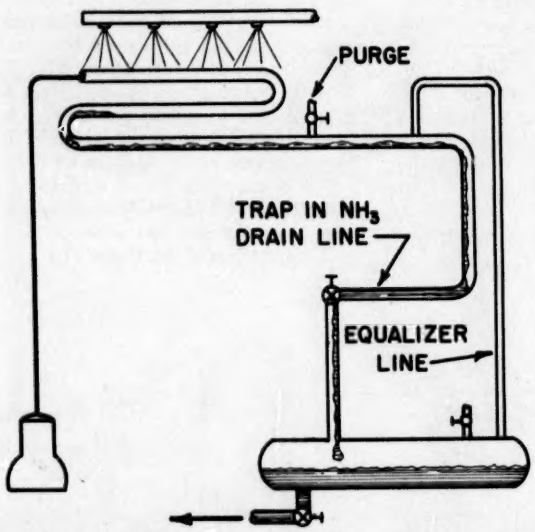

Fig. 5—A trapped condensate drain line will cause high head pressure if the receiver is in a warm place. Piping Change: Remove the trap or install on equalizer line.

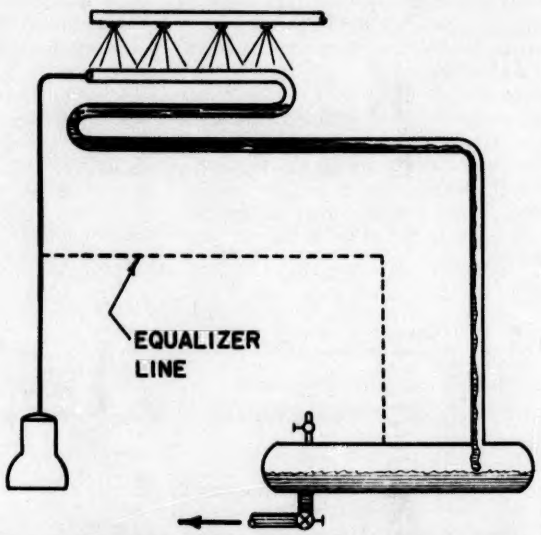

Fig. 6—This type of equalizer arrangement must be avoided. It short-circuits the condenser and decreases its capacity. See Figs. 8 & 9 for proper arrangements.

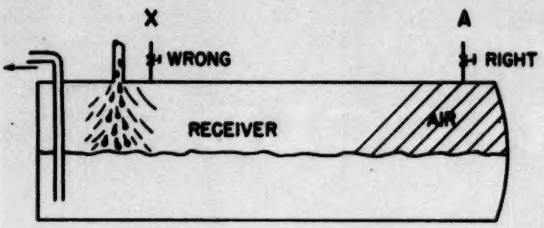

Fig. 6—Manufacturer contends that purging should be from the "dead end" of an ammonia receiver, as pictured.

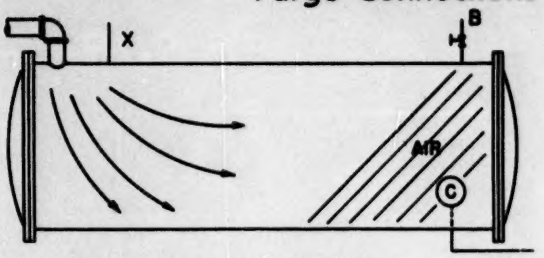

Fig. 7—Gas flow drives non-condensibles to the far end of a horizontal shell-and-tube condenser; purge there.

(Continued From Page 15)

liquid level for comfort, so a new purge connection "B" was made a few inches above this point. Results were startling, to say the least. After three days of continuous purging, the head pressure was dropped nearly 15 lbs., which represents a big saving on a 300-ton refrigerating system.

Now that the importance of purge connection location is established, briefly examine purge connection locations on the receiver.

Receiver Connections

Fig. 6 shows a typical horizontal inlet at one end. Not infrequently, a purge connection ("X") will be made close to the liquid inlet just because it is handy. It is almost impossible to purge from point "X". The incoming liquid will be surrounded by a halo or cloud of almost pure refrigerant, while non-condensibles in the receiver will be concentrated at the end farthest removed from the liquid inlet. Therefore, the purge connection should be at point "A".

Shell—and—Tube Taps

Fig. 7 shows a typical horizontal shell-and-tube condenser. The purge connection at "X" would be hopeless. Gas from the compressor is going past this point at a high velocity. The flow of incoming gas blows non-condensibles to the far end of the condenser. The ideal purge connection would be a few inches above the bottom of the condenser at approximately point "C". However, this is a connection that is almost impossible to make, and, generally speaking, good results are obtained from "B".

Vertical Condensers

There are two schools of thought on purge connections from a vertical shell and tube condenser as shown in Fig. 8. Very good results have been obtained with a purge connection just a few inches above the liquid outlet. On the other hand, a number of successful installations with the purge connection at the top of the condenser, are known to Armstrong and NAPRE members as well.

Evaporative Types Difficult

The purge connection for an evaporative condenser is easy to establish in theory, but difficult to make. Fig. 9 shows a simplified cross-section of an evaporative condenser. It is good practice to install an oil separator just ahead of the condenser, and there are those who recommend a purge connection from the oil separator.

Such a purge connection might be of value for purging when the compressor is down, but it is of no value whatever when the compressor is running. Again refrigerant gas passing through the oil separator is at relatively high velocity and no air concentration is expected at this point.

When the gas starts down the serpentine tubes, the initial velocity place, the gas volume is reduced, and, therefore, the velocity is lower. The actual gas velocity at the collection header is very small, and this is where non-condensibles will be found. To a steam trap man, point "B" looks like the logical place to make a purge connection.

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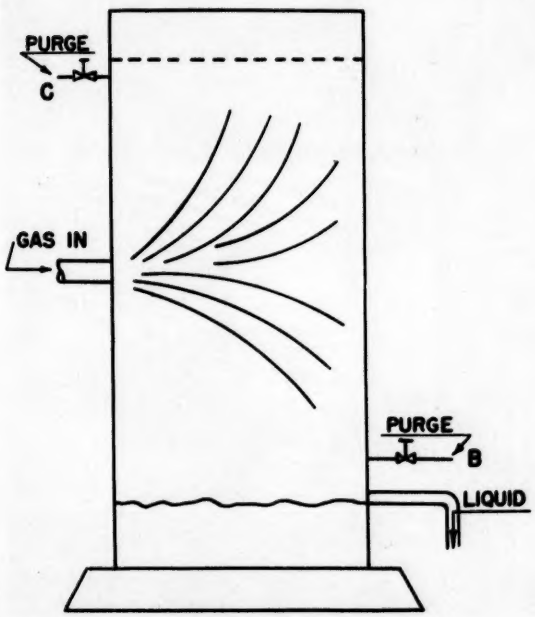


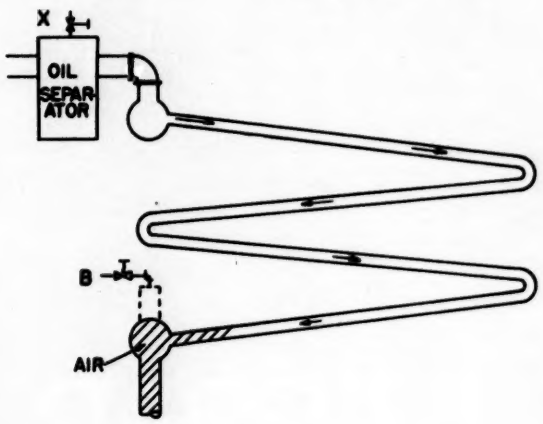
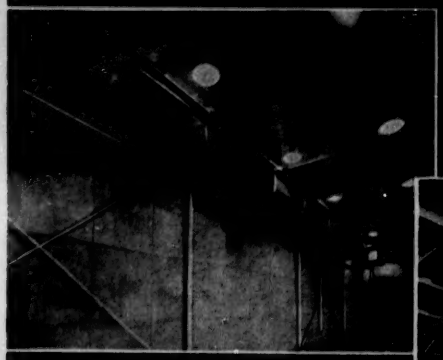


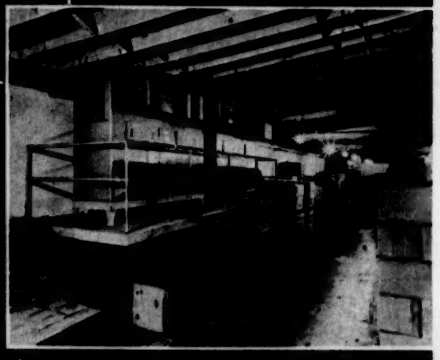
Fig. 8—Successful operators report satisfactory purging from both points "B" and "C" with vertical condensers.

Fig. 9—Manufacturer recommends purging from point "B" in evaporative condensers; at "X" when plant is down.

BE SURE — SPECIFY

RECOLD





RECOLD

CORPORATION

(Continued From Page 17)

Fig. 10 shows a refrigerating system with an automatic purger, and correctly located purge connections at the receiver and condenser. Remember, some engineers said that the purge connection at the receiver only was sufficient, while others wanted purge connections at the condenser as well as the receiver? Now, engineers don't make purge connections for the fun of it, so it can be assumed that for some systems the purge connection on the condenser actually is necessary. Why?

Provide Adequate Drain

A number of the engineers who replied to the question in INDUSTRIAL REFRIGERATION stressed the importance of an adequate liquid line between the condenser and the receiver. The need for such an adequate line is certainly supported by more than logic. The solid black liquid line in Fig. 10 is on the small side, and has a rather long, almost horizontal run of pipe. When the condenser is operating at capacity, this line could be nearly full of liquid. Any flash vapor formed in such a pipe would tend to prevent any air from leaving the condenser and getting down to the receiver. But, with the large, well-pitched dotted line liquid connection, there is plenty of room for both liquid and gas. The flow of gas across the condenser could very well blow the air bubbles loose from the tubes so that it could flow to the receiver along with the liquid.

Of course, this paper is dealing with installation instructions for an automatic purger. These instructions apply to the purger only, and it is not presumed to tell experienced refrigeration men how they should pipe up their equipment. Nor can the purger manufacturer assume that the condenser to receiver liquid line is 100 percent adequate. If the liquid line is too small and a purge connection is necessary from the condenser, it is a lot simpler to make the condenser purge connection than it would be to re-pipe the liquid drain.

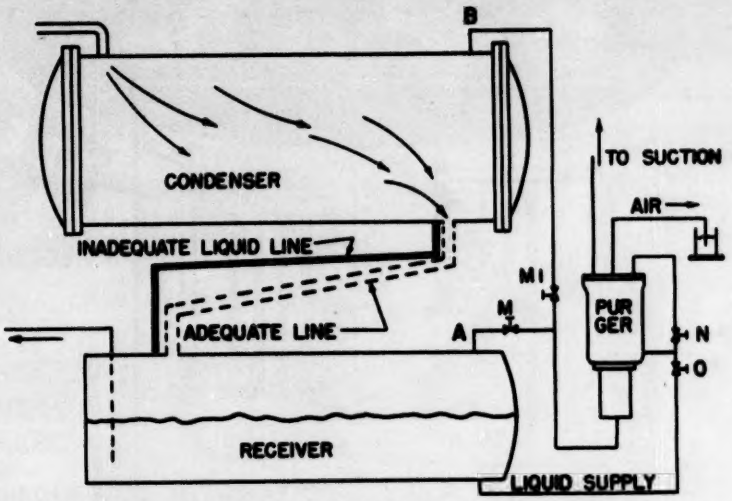


Fig. 10—Recommended hook-up of a purge system with connections from condenser and receiver. Emphasis is placed on adequate liquid drain.

Vent Lines

A number of engineers mentioned the importance of proper vent lines between the receiver and the condenser. Fig. 11 shows a condenser-receiver system with two possible vent lines. The dotted vent line at the right would upset the automatic purge applecart. This dotted line leaves the receiver at the point where we recommend the purge connection, and also enters the condenser at the best purge point. If there is a back-flow from the receiver to the condenser through the vent line, non-condensibles that otherwise would accumulate at the dead end of the receiver will flow right up to the condenser, and the purger would have to operate on lean mixture.

Contrast the dotted vent line with the solid vent line at the left. The solid line leaves the receiver near the liquid inlet and enters the condenser at some distance from the logical purge point. At the start-up of an automatic purger, there would presumably be a high concentration of non-condensibles at the dead end of the receiver, which makes for efficient purger operation.

One of the engineers replying to our question pointed out that under certain atmospheric conditions or load changes, air in the receiver would migrate to the condenser, mak-

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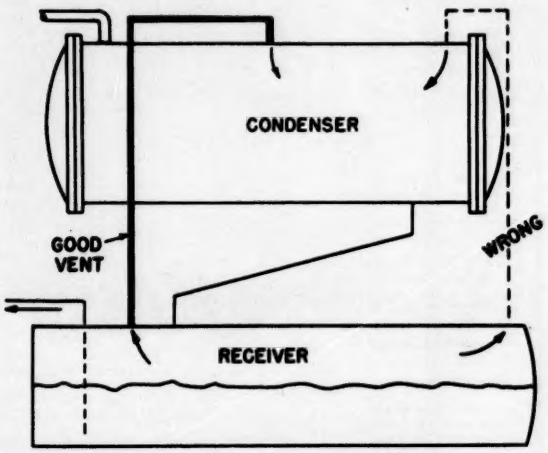

Fig. 11—Purger manufacturer contends dotted vent line nullifies purger operation; recommends heavy connection.

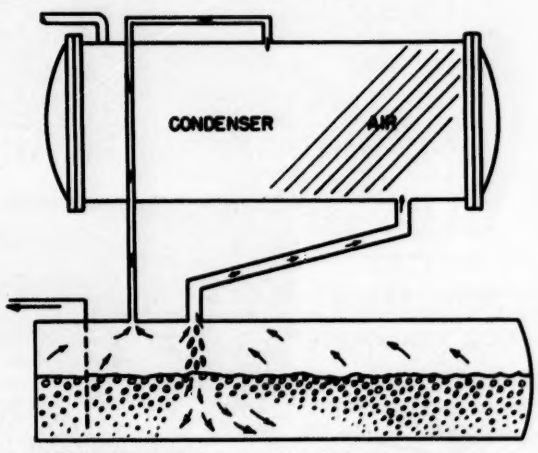

Fig. 12—With proper venting and draining, steady condensing will move air from receiver to condenser.

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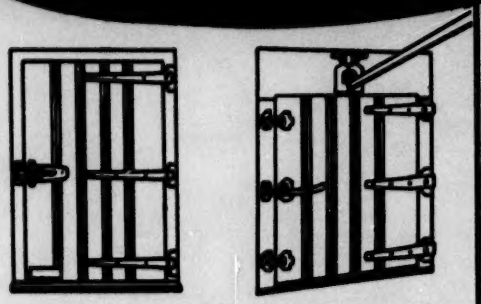

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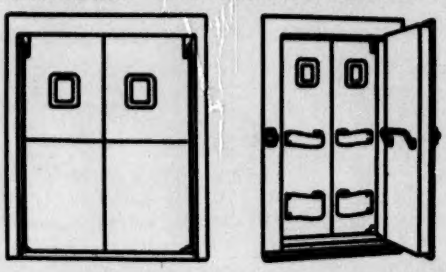

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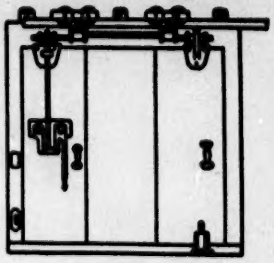

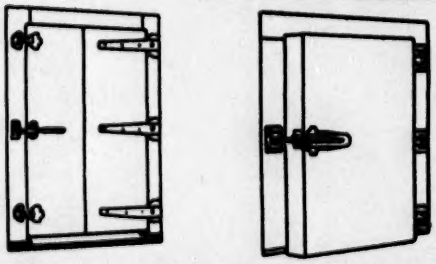

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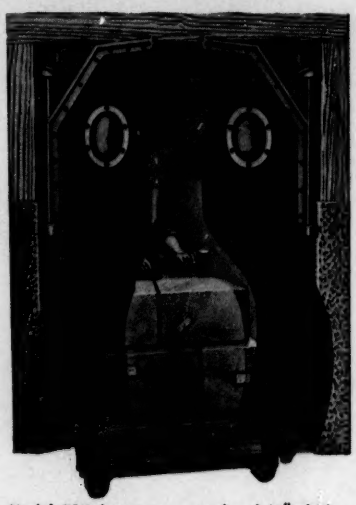

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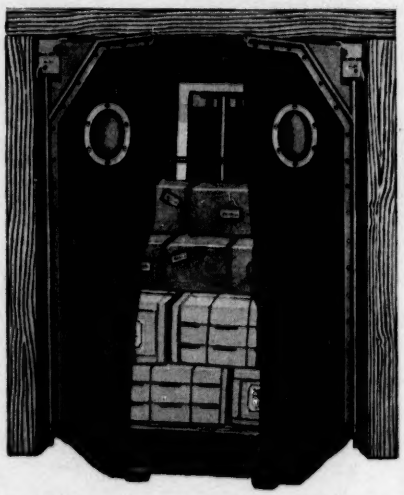

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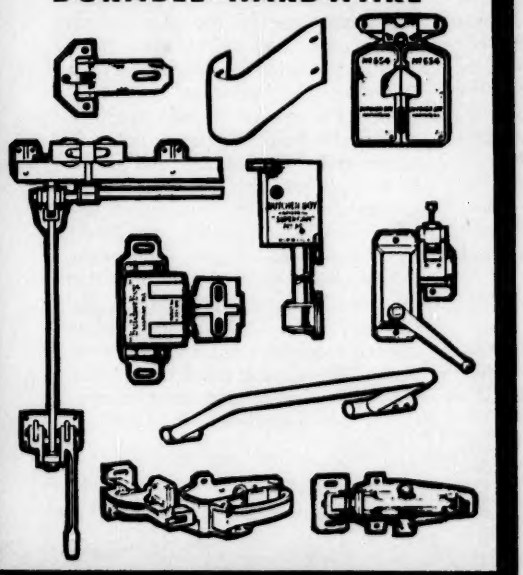

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From the President's Desk

Safety, Technology Emphasized by Burns

Roy T. Burns

▶▶▶ CHICAGO CHAPTER, NAPRE, is either opportunist or perhaps super-sensitive to recent fire and safety shortcomings which have been brought into prominent focus through a horrible accident in that city. Headlines in newspapers across the country had hardly been reduced to two and three-column width when the Chapter announced that its principle speaker would be a National Safety Council representative. Although the Chapter program had been planned for some time, it could not have been more timely.

At the risk of alienating the chapter reporter's friendship, the national president feels that it is important to repeat some of the statistics given by this Chicago speaker. Unfortunate as the circumstances were, the school fire disaster in that city emphasized the point made by the Safety Council representative that it is the simple, little things that count. A door at the top of the stair well could probably have made the difference in life or death for 90 children and 3 adults.

That simple little thing has been just as important in refrigerating enterprises. It may not have been in the form of a door. It may have been in the form of a refrigerant leak, coupled with the careless use of an insulator's asphalt kettle; the careless application of a torch to an improperly vented vessel; or the thoughtless insertion of a hand in a piece of machinery that suddenly rotated or shifted. The question should be asked time and time again, as the Chicago speaker, Raymond Ellis, Jr., pointed out "Is It Safe?"

Costly Safety Statistics

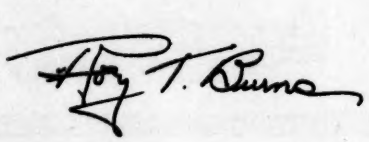
Safety Representative Ellis showed where a national retail grocery chain in one large metropolitan area on the West Coast, annually must sell an additional $30,000,000 in order to acquire sufficient profit to offset compensations where accidents occured in that same corresponding year! On the East coast, another similar gorcery chain in one location will spend its annual profits from 1958 through the year 1986 to pay for one very sad experience. A chain of hamburger shops has shown where one simple safety oversight of a less serious nature required the sale of an additional 50,000 hamburgers to compensate for this experience.

Ellis, in his talk, again emphasized a point which A. R. "Gus" Carstensen, Chairman of the National Association of Refrigerated Warehouses' Safety Committee, has often told NAPRE members, "Your frequency rate is low, but Oh Boy, your severity rate is out of this world. In other words, refrigerating engineers don't have too many accidents, but when they do, they either kill or maim.

This should be sufficient suggestion to all NAPRE chapters to devote at least one chapter meeting in the first six months of 1959 to safety. Possibly take the meeting to a plant or incorporate it as a highlight of a plant visit, and keep asking the question, "Is it safe,"

Occupational Outlook

During the last quarter of 1958, the U. S. Department of Labor in its employment outlook emphasized the importance of the practical air conditioning and refrigeration man. In an occupational outlook summary, it was emphasized that more technicians are needed to help scientists and professional engineers, not only in research, development and manufacturing, but also to operate and maintain complicated instruments and automatically controlled machinery used by modern industry. Once again, it was vividly pointed out to us that the practical man is no longer a dial watcher, valve twister and Stilson wrench mechanic, but a skilled technician. The outlook for those NAPRE members who become more competent and proficient, is excellent. 'Nuff-sed?



NAPRE QUESTION BOX

H. P. Hayes

HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

Insulation K Factor

QUESTION: What is the K factor of semi-rigid pre-formed one-inch thick fibrous glass insulation encased in a polyester film?—S.R.,Minn.

ANSWER: The only product that we can recall which might fit this description was a fabrication that Owens Corning Fiberglas Corp. prepared a few years ago for certain trial applications. It consisted of the regular Fiberglas PF Insulation enclosed in a film of polyethylene. This film was designed to prevent any moisture from entering the insulation and the combination fabricated to fit inside the equipment to be insulated.

To the best of their knowledge Owens Corning engineers advise that the wrapping of polyethylene did not affect the conductivity of the basic Fiberglas material and over all conductivity should not have changed to any particle degree. These conductivities may be obtained by referring to any of their published material on faced or coated insulation. A thermal conductivity chart generally accompanies such literature.—**J.R.K.**

Removing Oil From Aerosols

QUESTION: Aero-sol propellants received via railroad car at our charging plant are discharged to storage by pressurizing the tank car (tankers have outlets similar to refrigerant receivers). We employ a Brunner compressor, 4-cyl. Model NR-10 (V type, 3-5/8 x 2-1/2-in) W56-1 operating at approximately 420 rpm. This unit taking suction from our storage tank, discharges through an oil separator and into the tank car at 70 psig.

Our problem is this: The supplier contends that we are contaminating the tank car with refrigerant oil and he is back-charging us for cleaning. Our oil separator has no name plate data on it so we do not know the particulars other than it has a 1-5/8-in. OD inlet and outlet, etc. However, we believe that the separator is probably too small or its structure is ineffective. Where can we find literature that would describe the most effective way of removing oil from the compressed aero-sols? They are mostly Refrigerant-12, and combinations of halocarbon gases involving Refrigerant-12. Is there any literature that specifies size and internal arrangements for oil separator vessels?

—C.W., Chgo., Ill.

ANSWER: Exceptional delay has occurred in replying to this question due to non-availability of specific literature on the subject, and reluctance of most refrigerating equipment manufacturers or system engineers to volunteer information. The latter is due, apparently, to the fact that few firms actually engage in designing such unloading systems.

General Chemical Div., Allied Chemical Corp., did reply—for which the Question Box is very grateful: "In direct reply to your questions, we have no knowledge of published literature available from manufacturers of oil separators describing their use in the removal of oil from aerosol propellants. All manufacturers, however, publish brochures presenting internal design data and suggested model numbers of their oil separators for various refrigeration system horsepower ratings. With this information

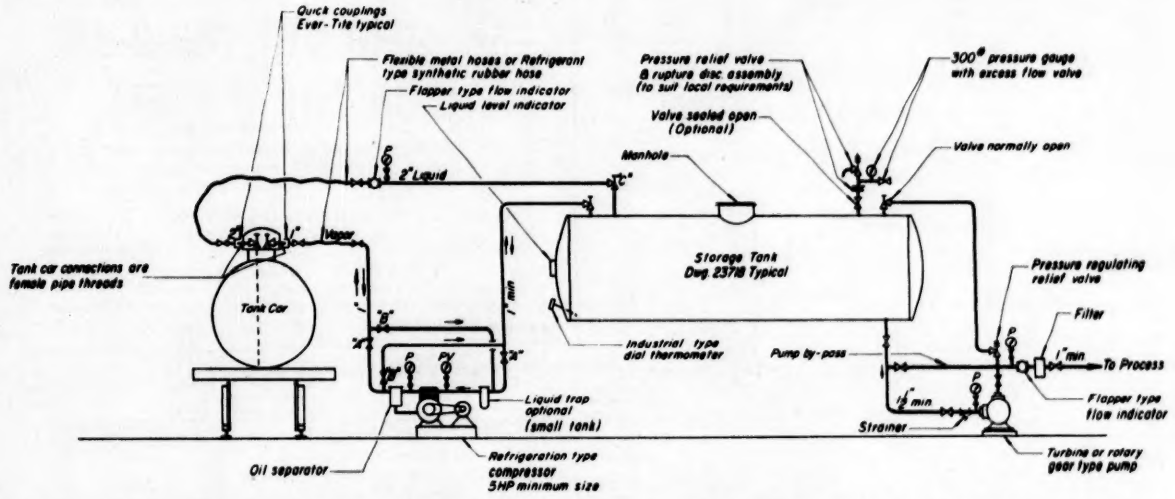


Fig. 1 — Tank car unloading of aerosol propellants by compressor method. Oil separator should be twice refrigeration service size. Graphite ringed or non-lubrication type compressor is a good alternate.

the design engineer can specify the size and type equipment for retaining oil in the compressor body, for each propellant unloading system.

Probable Trouble Points

"From the information submitted, it seems likely that the source of trouble is one or more of these:

1) Inoperative or undersized oil separator
2) Compressor discharge pressure not sufficiently above suction pressure
3) Compressor pumping excessive amount of oil

"Considering the above conditions in order, the compressor in use, from the data presented, is designed for a 7-1/2 to 15 hp refrigeration system and is operating at around 7-1/2 hp. There is no way of telling from the information received what the recommended application is for the oil separator. However, assuming that it was correctly sized for a 7-1/2 hp refrigeration system, it would be undersized for this application.

Use Larger Separator

"For propellant transfer, the general practice is to *use an oil separator at least twice the normal refrigeration application size.* Therefore, for this particular case, an oil separator sized for a system of at least 15 hp would be installed.

"It must be remembered, however, that no oil separator will remove oil completely. The larger the separator, the closer one approaches complete removal. A double-size separator is based upon a balance between the cost of the separator and the amount of oil removal desired.

Check Pressure Differential

"The discharge pressure as stated in your letter was 50 to 70 psig. Depending on the ambient temperature of the storage tanks from which the suction vapors are drawn, the suction pressures could exceed the discharge pressure. Under such conditions, some oil separators conceivably could pump the oil from the crankcase up through the separator into the discharge line.

"In order to prevent such a condition, the suction service valve may be throttled, or a throttling valve may be installed between the oil separator and the tank car to increase discharge pressure well above suction pressures. For example, such condition may occur between an indoor storage tank at around 70 to 80 F and a tank car arriving in winter at subzero temperatures.

Recommends Carbon Rings, Alternate Transfer Methods

"If the compressor is pumping excessive amounts of oil, it will be necessary to overhaul the unit. Worn rings, cylinder walls, etc. contribute to excessive oil pumping. An alternate action would be to replace the compressor with one which employs graphite rings and does not require oil for lubrication.

"Another method of eliminating oil contamination is the installation of a suitable turbine or rotary gear type pump along with a suitable heater to transfer the liquid from the tank car to the storage tank. The accompanying drawings (Fig. 1 and 2) illustrate typical diagrams for both compressor and pump unloading systems."

—H. P. Hayes

More Answers To Agricultural NH_3

QUESTION: There are, we believe two grades of ammonia being manufactured, one is commercial and the other refrigeration grade. We would like to be assured that we are supplied anhydrous ammonia of the refrigeration grade. What is the composition and physical property of this commodity and how can it be tested to assure us that it is refrigeration grade? What are the disadvantages of commercial grade anhydrous ammonia for use in refrigerating plants?

—K.R.B., Karachi.

Agricultural grade ammonia (so-called) is being made available in many areas where refrigerating plants are located. We have been told there is no difference between this ammonia and the kind purchased from refrigeration supply companies. The Question Box can render a service if it would publish unbiased and authentic information on both kinds of ammonia.

—NAII.

ANSWER NO. 2: The reply published here was delayed in NAPRE's inter-office mail and was not used in November '58 with other answers to this question (See November INDUSTRIAL REFRIGERATION, page 25). Additional points are made which are important; hence, publication here:

"This question was asked three prominent refrigeration equipment manufacturers. Their responses[1]:

[1]This particular manufacturer ran a series of full page advertisements in a number of refrigeration trade publications in 1957, in which NH_3 purity was emphasized by picturing and quoting leading equipment manufacturers.

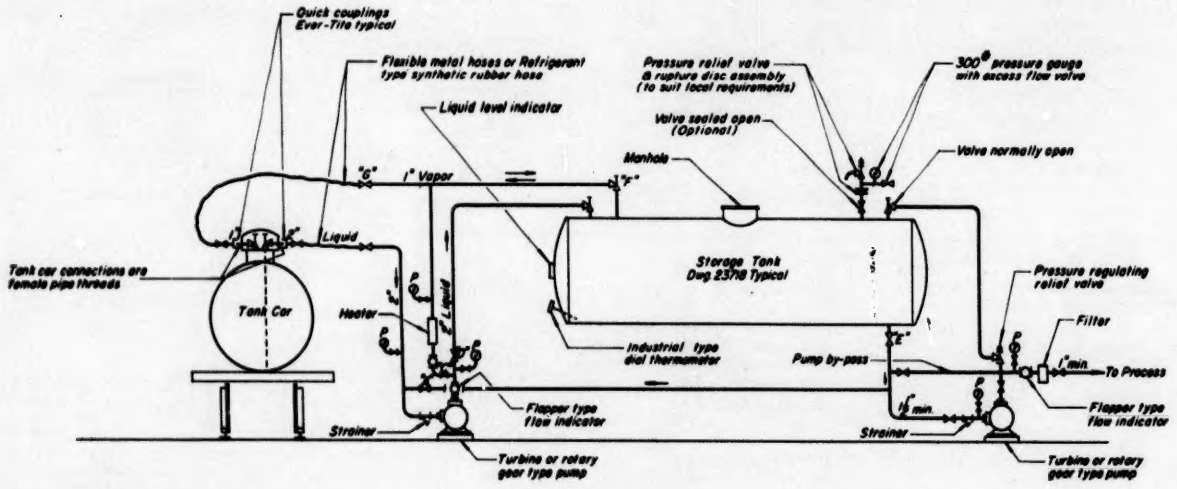


Fig. 2 — Unloading propellants by pump and heater method appears to be more popular (there are more installations of this type with turbine or rotary gear pumps). — *Both diagrams Courtesy of "Genetron".*

1) 'The refrigeration system should be free of contaminants which might exist in inferior grades of ammonia. The refrigeration system should contain only the refrigerant, and should exclude such foreign substances as water, air, oil or other harmful ingredients.

2) 'We always specify Refrigeration Grade Anhydrous Ammonia containing 99.95 percent minimum pure ammonia, for charging both new and old refrigeration systems. We do not approve the use of a grade specifying only 95.5 percent ammonia or less.

'It is also axiomatic in the refrigeration industry to exclude moisture as completely as possible from refrigeration systems. The presence of moisture in an ammonia system under some conditions will result in extensive corrosion, sludge formation and damage to wearing parts. For this reason we prefer to charge our systems with ammonia which is as dry as possible to obtain.

3) 'We will have no part in the use of Fertilizer Grade ammonia for refrigeration systems. At the best, the problem of moisture is a serious item, especially low temperature installations.

H_2O: Five Pints in Half-Ton

'To lower the percentage of pure Refrigeration Anhydrous Ammonia will invite expansion valve and float valve needle troubles. When moisture reaches the point of the needle of an expansion apparatus in a low temperature installation, a freeze is set up which almost instantly will stop the flow of refrigerant. To remedy such an incident may call for a complete evacuation of the system.'"

"In Table I are the manufacturers' specifications for each grade.

"While the difference in specifications may not appear great, the water allowable in 1,000 lbs. of Commercial Grade Ammonia is five pints. Excessive oil, of course, reduces the efficiency of the refrigeration system."

—R.S.P., Mgr.,
Armour Ammonia Div.

As the reader may know, this manufacturer is also one of the largest users of ammonia for refrigeration in this country. They told IR they have never used Commercial or Fertilizer Grade Ammonia in their own refrigeration plants. In one of their major plants they add 300,000 lbs. of Refrigeration Grade Ammonia per year on the average. "We assure you this, if we felt the Fertilizer Grade would be equally satisfactory we would utilize that product," stated the manager of this producer-user firm.

TABLE I — MANUFACTURERS' SPECIFICATIONS FOR ANHYDROUS AMMONIA

	Refrigeration Grade	Commercial Grade
Moisture	Max 0.01% by wt.	Max .05% by wt.
Ammonia	Min 99.99% by wt.	Min 99.5% by wt.
Oil	Max 3 ppm	Max 5 ppm
Non-Condensable Gas	Max 0.1 ml/gm NH_3	
Pyridine	None by test	

More Factors Under Research

Being in the fertilizer business also, Armour has had a great deal of experience with the product usually shipped to fertilizer plants. In that phase of their business they are only interested in the nitrogen content; impurities are not important. NH_3 is seldom tested upon arrival in that field as a few additional impurities are not important. Refrigeration Grade *is* tested before being shipped by the producer, tested upon arrival at the point of bulk operations, and *is finally* tested in the container used for delivery to refrigeration plant.

Water conditioning problems are individual, too...

BE SURE YOU GET THE WRIGHT ANSWER

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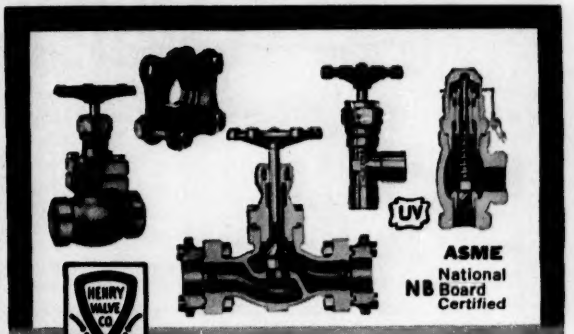

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VALVES AND ACCESSORIES FOR REFRIGERATION AND INDUSTRIAL APPLICATIONS

It was pointed out to the Question Box that Commercial Grade Ammonia does not have any limitation as to the amount of non-condensable gases it contains. As many readers will know, the filling limit of a tank car is 56 percent of its water capacity. The vapor space in the car could contain a large amount of non-basic gas which could be detrimental to the operation of refrigeration equipment. Fertilizer Grade Ammonia is not tested for other impurities, such as Pyridine, stated Armour's NH_3 manager. His firm knows of no manufacturer of ammonia who will recommend Fertilizer Grade Ammonia for refrigeration purposes.

Some readers may also be familiar with the research being conducted by the Agricultural Ammonia Institute at Georgia Institute of Technology to determine the reason or reasons for tank failures due to stress corrosion. The impurities in Fertilizer Grade Ammonia as well as other factors are being studied in this connection. If these impurities contribute to tank failures this could be a serious problem in refrigeration equipment.

In view of the fact that bulk Refrigeration Grade Anhydrous Ammonia is available in most parts of the country at only a few cents higher than Commercial or Fertilizer Grade, it does not seem to be economically sound to use an inferior grade. The cost of ammonia in cylinders is mostly freight on the product, full and empty container, distribution costs and filling costs; all of which would be identical with Commercial or Fertilizer grade in same quantities. If Refrigeration Grade Anhydrous Ammonia is not available at a reasonable differential, then an operating firm might be able to justify use of the less pure product on the basis that the firm has no choice. That is not the case in most parts of the United States.

Our own conclusion is that any modest premium it might cost to use Refrigeration Grade is returned many times in more efficient operating and less maintenance costs.

—J. M. McGrath.

V-Belt Article Prompts Drive Conversion Question

QUESTION: "Long-Lived V-Belts" in September 1958 IR prompted me to write about a silent chain drive which broke. A new chain was not available, the mechanic made a belt drive out of it wrapping lengths of silent chain around the sprockets and making those lengths endless. On the backs of the chains then, which were fairly smooth, he used a belt drive. The diameters of the sprockets were about 10 and 16 inches respectively, and with the chain on, about one inch greater. The width of the chain (also the belt) was 10 inches. The speed of the motor was 900 rpm. The motor horespower was 75.

Flat Belt Precludes Auto-Start

When consulted, I figured that the belt speed was about 2590 fpm. This speed should allow a 2-ply belt to transmit 62.75 hp—which is fairly close to the above 75 hp. However, I further suggested a special high grade belt should have been used. Now, I'll ask the Question Box what was asked of me, "Why not convert to V-Belt drive? Automatic start is almost impossible with flat belt."

—W. F. S., Newark.

ANSWER: When an article prompts a letter such as this inquiry, more often than not the consultant has already solved the problem; and, has had the opportunity to confer with equipment company engineers. Therefore the Question Box replied with "What was *your* answer?"

Pride of ownership

means valves, too!

You've probably heard or said many times that "a good cup of coffee can make a restaurant." Hubbell valves, too, have built their reputation on **honest quality.** Every step of production, from Hubbell's own castings to finished controls, reflects the highest degree of precision craftsmanship—**honest value** that makes possjble the finest in line performance and long, trouble-free life. That's why refrigeration men everywhere have always pointed with pride to the Hubbell valves in their systems.

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"Although the converted drive is said to be satisfactory," was the reply, "the writer consulted the manufacturer of a high grade belt and his engineers, and this is what they said:

'The diameter of the drive would be 11 inches and we would not, under any circumstances, install a pulley of this diameter on a motor of 75 hp rating, at 900 rpm. The minimum pulley recommended for this capacity motor is 15-in. diam.

'Furthermore, we would not install a 10-in belt to handle the load at a belt speed of 2600 ft/min. A chain drive is usually utilized for heavy duty loads and a 75 hp motor will have a starting capacity of at least 25 percent of its rated capacity, and, if it is a synchronous motor it will have a 100 percent capacity.

'Neither V-belts nor flat belts would be satisfactory unless the minimum diameter of the drive pulley were increased, and the width of the drive pulley increased as well in order to use a wider belt.'

"This writer is inclined to agree with the above manufacturer and his engineers, and would convert a similar pair of chain sprockets into pulleys of larger diameter capable of taking a wider belt. Or, convert to V-belt sheaves of proper dimensions.

"It is true that V-belts are more satisfactory as a rule where automatic starting conditions are severe.

—W.F.S., Newark.

Thanks to this N.J. consultant for an interesting, as well as informative "kink".—J.W.McGrath, Cal Poly.

LMTD By Nomograph

QUESTION: Would the practical engineer have an occasion to be involved with a formula such as that determining the Logarithmic Mean Temperature Difference? Or, do such pencil and paper manipulations come up only in the realm of the designing engineer? Would a Nomograph cut corners for both the professional and the practical engineer involved in such computations?—J.R.K.

ANSWER: Indeed a nomograph does save time for the professional engineer in the solution of heat transfer problems. Frequently it may save time for the practical engineer as well. Witness:

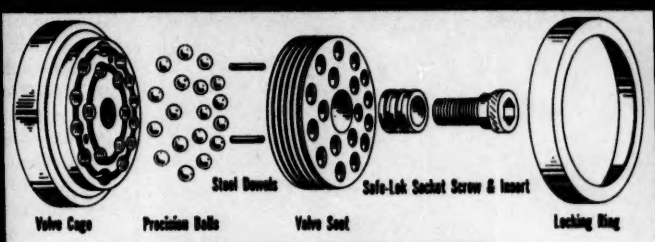
"It is not often that the operating engineer would require the use of the LMTD for averaging the capacity of a given coil. However, as pointed out by the late Professor H. G. Venemann in REFRIGERATION THEORY AND APPLICATIONS pp 276-277, in the case of calculating loads over a wide range of temperature differences, the use of the LMTD is necessary for accuracy. For practical purposes, it is usually sufficient to use the arithmetic TD.

"The formula may be found in several places, but requires some mathematics to arrive at an answer. To quote Guy King on page 282, BASIC REFRIGERATION: 'To save time and the need of logarithmic tables to solve this formula, tables of answers have been made up in Table A-14. From this table the answer for . . . (an example) . . . or any other similar problem can be read directly.'

"Table A-14 may be found on page 475, BASIC REFRIGERATION. A similar table has been published by the Niagara Blower Co. as Sheet 27, Section IX of their equipment catalog. Dunham-Bush, Inc. includes a monograph on page 31 of their Air Conditioning Manual.—Q.M., NYC."

To simplify equipment selection procedure for its customers, the Dean Thermo-Panel Division produces a nomograph for determining the Log Mean Temperature Difference, the use of which is simplicity itself. These 8½ x 11-in. charts may be had at no cost.—J. A. Hayes, Cal Poly.

You Can See The Difference!!!



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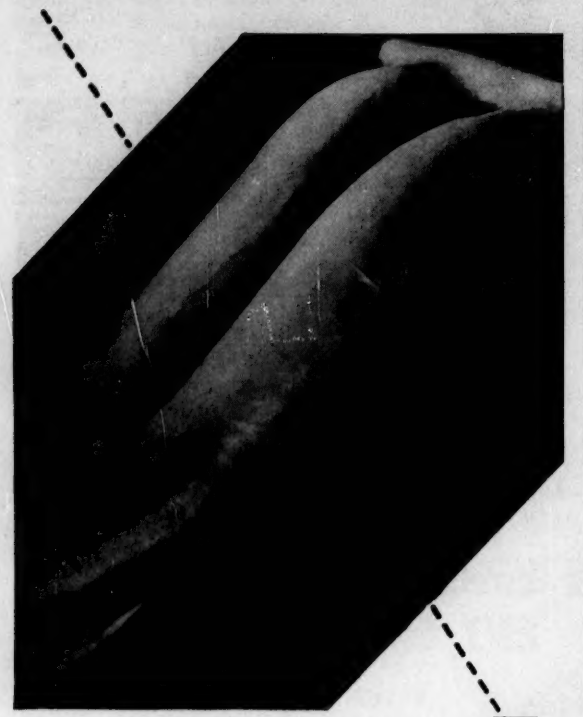

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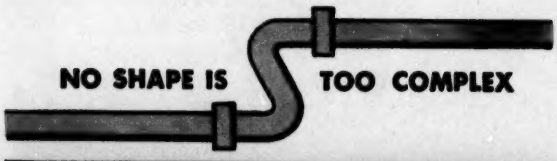

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Book Reviews

New Applications Volume For ASRE Data Series

ASRE DATA BOOK $12.00

AMERICAN SOCIETY REFRIGERATING ENGINEERS

▶▶▶ FIRST of a new four-volume series, REFRIGERATION APPLICATIONS, ASRE DATA BOOK, made its appearance in the last quarter of 1958, although it is designated as Vol. I, No. 1, and the date 1959.

The new book has been broadened from the 6 x 9, to an 8 x 11-in. volume in physical appearance. Between the binding there are 12 sections as in the past. However, a couple of sections have been replaced and their order rearranged.

Volume II of the new Data Book series is to cover **Air Conditioning Applications,** and is scheduled for publication in 1960. **Volume III** will deal with **Refrigeration** and **Air Conditioning Equipment** (the old Design Volume) and will make its appearance in 1961. **Volume IV** will be devoted to **Refrigeration and Air Conditioning Tables and Fundamentals**; also to be published in 1961.

One more chapter was added to the Low Temperature Application section and three additional chapters to Industrial Refrigeration. In place of Comfort Air Conditioning (Section 7) will be found Refrigeration Piping Systems, Chapters 52 and 53. Section 8 covers such supplementary items as Associations, Index, Manufacturers and Products, Trade Names of Refrigerants corresponding to the ASRE Standard Designation, and the ASRE Numbering System.

Three additional chapters are planned for the first revision of this volume under Section 7, Refrigeration Piping Systems. One additional chapter will deal with Ammonia, another with Multi-stage Applications and the third with Water and Brine Piping.

Revise B9.1 Safety Code for Mechanical Refrigeration

SAFETY CODE FOR MECHANICAL REFRIGERATION $1.00

AMERICAN STANDARDS ASSOCIATION

▶▶▶ AMERICAN Standards Association announced in December 1958, the availability of the *Revised* AMERICAN STANDARD SAFETY CODE FOR MECHANICAL REFRIGERATION (ASA B9.1–1958) The code is intended to provide standards of safety which can be adopted by regulatory authorities or any organization using mechanical refrigerating equipment. For the first time, occupancy classification includes single family private residences.

Sponsored by ASRE, the ASA publication covers safety, design, construction, installation, operation and inspection of every refrigeration system employing a fluid which is alternately vaporized and liquefied in its refrigerating cycle. The code does not apply to water or air refrigerant nor to refrigeration systems installed on railroad equipment, in motor vehicles or motor drawn transportation, or on shipboard.

NAPRE Revises Contents of Operating Data Book

NAPRE OPERATING DATA BOOK $5.00

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS, INC.

▶▶▶ LATEST NAPRE OPERATING DATA BOOK published in the last quarter of 1958, demonstrates a change not only in editorial content, but in policy as well. Between the covers, the new look is divided four ways:

Part I presents instruction on the installation or **Erection** of all components in the refrigerating system. **Part II** is devoted to **Operating**; i.e., instruction on the actual starting, stopping, seasonal shutdown or layup, and the opening of a season and startup of equipment.

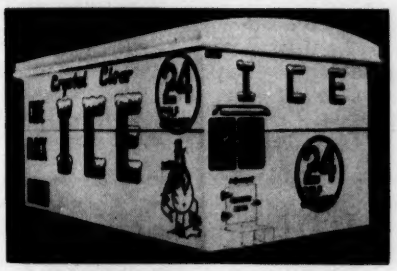
Part III is given over to **Maintenance**; instructions on service, inspection, and maintenance that will add to the longevity of refrigeration machinery and the associated components that make up the system.

Part IV could properly be called the Chief Engineer's Section. It deals with **Supervision**—management of both personnel and machinery in the refrigerating plant. In this issue a paper by one of NAPRE's own members outlines establishment of purchasing and contracting procedures. Many industries employing industrial refrigeration have pointed out that NAPRE does an excellent training job for the practical man working under others, but really offers little advance training in leadership and plant management. This portion (Part IV) of the OPERATING DATA BOOK is intended to satisfy that obligation to the industry.

K. G. BROWN

Presents

the NEW Multi-Screw VENDOR for 1959



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- **These new vendors are now made in lengths up to 20' which will vend 268 10# bags plus 132-25# blocks out of the same delivery door, (400 Sales).**
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- **Radical invention, trouble free, more storage space by design, lower operational cost.**

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ILLUSTRATED 9' x 16' Station vends 168-10# bags and 86-25# block.

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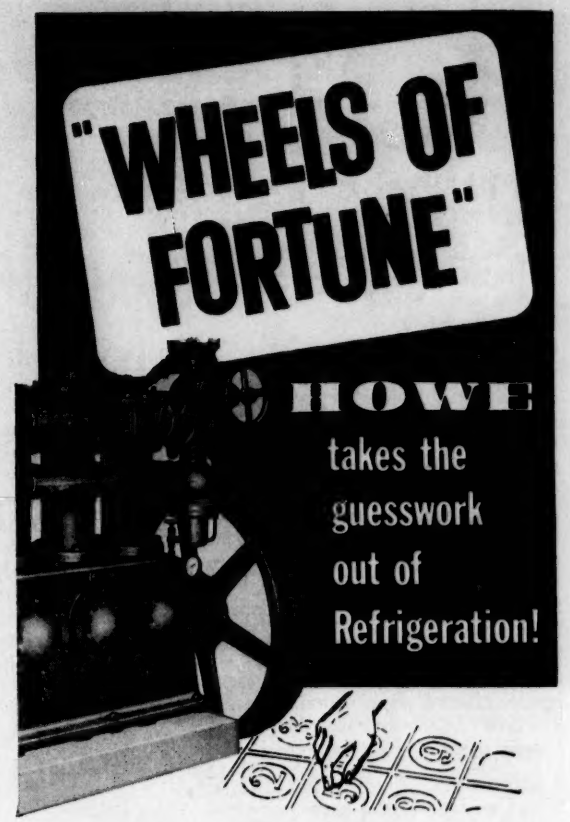

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Radiation Notes:

Private Research Fades

▶▶▶MAJOR food processing concerns in the United States have reduced or dropped entirely their own research in the field of food preservation by radiation. These were the reports coming out of the Grocery Manufacturers of American Convention in New York in November 1958.

Although the U. S. Army's Quartermaster General reported favorably on the progress in the Food and Container Institute's Ionizing Research Program, executives of Swift & Co., Thomas J. Lipton, Inc., and National Biscuit Co. were not so optimistic. An executive of Campbell Soup Co. indicated that food manufacturers were keeping a completely open mind on the subject, but were from Missouri; they would have to be shown, as at present they didn't see a glimmer for most irradiated foods. Campbell Soup had conducted some experiments for a couple of years but had done nothing since.

Ten Unsuccessful Years

The Swift executive indicated that his firm has slacked off experiments with the last quarter of 1958, because it has been unsuccessful after 10 years of research and spending of several hundred thousands of dollars. Color, taste and odor were the principal problems.

Nabisco's representative stated that they have not found any use for radiation preservation after ten years of hard work. Their principal problem is that the products can't be browned. They also have difficulty with odor and bad taste.

Lipton also discontinued independent research in the last quarter, after five years of research on soups. However, they will continue their research in conjunction with the Government toward developing new methods of feeding the Armed Forces.

European Ionizing Meet

▶▶▶MEETING IN ENGLAND Nov. 17 to 21, 1958, was the Food and Agricultural Organization, United Nations, on the subject of ionizing radiation use for food preservation. Purpose was to survey the present status of food irradiation, evaluate the significance of the technique for European countries, and to consider need for and possiblity of organizing international cooperation in food irradiation research in Europe. The meeting presented a number of papers and reviews by specialists from the U.S.

Army Plant By Bechtel

▶▶▶ACCORDING to an announcement by the U. S. Army Corps of Engineers, Bechtel Corp. will develop the final design and specifications for the irradiation plant to be built at the Sharpe General Depot, Lathrop, California. Reported to be the world's first full scale irradiation plant, it will be operated by the Quartermaster Corps as a pilot test center for new methods of preserving foods for shipment and storage.

Scheduled for completion in 1960, the facility will also be available to private concerns for determining feasibility of irradiation processes on a commercial basis. **Refrigeration,** although figured at the minimum requirements, **does presently figure in the irradiated food plans.**

TRRF Revises Chapters In Commodity Manual

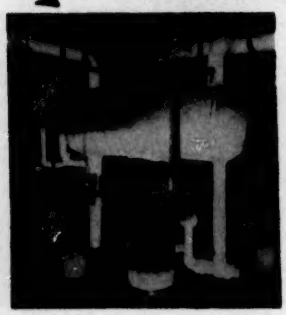
▶▶▶RECEIVED in December by members of The Refrigeration Research Foundation was a very healthy sized package of chapter revisions for the COMMODITY STORAGE MANUAL. In addition to revisions of various pages on refrigerated commodities, the insertions included one new subject—on furs and fur garments.

Methods and procedures followed in cold storage practice also had a number of chapters revised. For example, there was a revision on Controlled Atmosphere in Apple Storages, Temperature Measurement of Frozen Foods (including illustrations on measuring cased frozen food), and a new chapter on Rancidity and Anti-oxidants. Appearing to be new is a chapter on Condensation Control, while a revision of Defrosting was contained in the same mailing. A new four-page revision on Soil Temperature Measurement and Soil Sampling was included.

Also revised, were the chapters on Destruction of Insects by Cold Storage, a Carbon-dioxide Method of Rodent Control and Destruction of Trichinella Larvae by Freezing. Psychrometry and relative humidity were given considerable attention in the revisions. One page is devoted to Portable Psychrometer Stroller and six pages to the use of the Sling Psychrometer.

Humidity in refrigerated storage is treated in three parts, the first part dealing with the importance of humidity in cold storage, the second part with vapor pressure and the third part with methods of raising r.h. Determination of Relative Humidity in the Low Pressure Range by the Thermocouple Method and a Table of Relative Humidity and Dew points completed the revisions on that subject.

A RECIRCULATOR PUTS COILS TO WORK AND PROTECTS YOUR COMPRESSORS



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Industry Meetings

Air Conditioning Show — **Jan. 26-29**
INTERNATIONAL HEATING AND AIR CONDITIONING EXPOSITION
Convention Hall, Philadelphia

O-K-M Ice Manufacturing — **Jan. 18-20**
OKLA., KANS., MO. VALLEY ASSOCIATIONS (Jointly)
Skirvin Hotel, Oklahoma City

Maintenance Meeting — **Jan. 26-29**
10TH PLANT MAINTENANCE & ENGINEERING CONFERENCE
Public Auditorium, Cleveland

Heat'g & Air Cond'g Annual — **Jan. 26-30**
AMERICAN SOCIETY OF HEATING AND AIR CONDITIONING ENGINEERS
Bellevue-Stratford, Philadelphia

Truckers Meeting — **Jan. 29-30**
PRIVATE TRUCK COUNCIL OF AMERICA, INC.
Sherman Hotel, Chicago

Poultry Fact Finding — **Feb. 13-15**
INSTITUTE OF AMERICAN POULTRY INDUSTRIES
Municipal Auditorium, Kansas City, Mo.

Delta Ice Manufacturing — **Feb. 22-24**
DELTA STATES ICE ASSOCIATION
Buena Vista Hotel, Biloxi, Miss.

O-M-I Ice Making — **Feb. 22-24**
OHIO, MICH., IND. ASSOCIATIONS (Jointly)
Netherland Hilton Hotel, Cincinnati

Frozen Food Packing — **Mar. 1-5**
NATIONAL ASSN. OF FROZEN FOOD PACKERS
Conrad Hilton Hotel, Chicago

No. Car. Ice Manufacturing — **Mar. 15-17**
NORTH CAROLINA ICE ASSN.
Washington Duke Hotel, Durham

Northwest Ice Making — **Mar. 19-20**
NORTHWEST ASSOCIATION OF ICE INDUSTRIES
Vancouver, B.C.

Southern & Georgia Ice Mfg. — **Mar. 25-26**
SOUTHERN ICE EXCHANGE AND GEORGIA ICE MFG. ASS'N
Biltmore Hotel, Atlanta

Refrigeration Research — **Apr. 2-5**
THE REFRIGERATION RESEARCH FOUNDATION
Statler-Hilton, Washington, D.C.

Refrigerated Warehousing — **Apr. 5-9**
NATIONAL ASSOCIATION OF REFRIGERATED WAREHOUSES, INC.
Statler-Hilton, Washington, D.C.

Meat Packing — **Apr. 16-19**
NATIONAL INDEPENDENT MEAT PACKERS ASSN.
Palmer House, Chicago

Air Cond'g & Refrig'n — **May 3-6**
AIR-CONDITIONING AND REFRIGERATION INSTITUTE
The Homestead, Hot Springs, Va.

Fire Protection — **May 25-29**
NATIONAL FIRE PROTECTION ASSN.
Atlantic City, N.J.

Air-Cond'g & Refrig'n Exposition — **Nov. 2-5**
11TH EXPOSITION OF THE AIR-CONDITIONING AND REFRIGERATION INDUSTRY
Convention Hall, Atlantic City, N.J.

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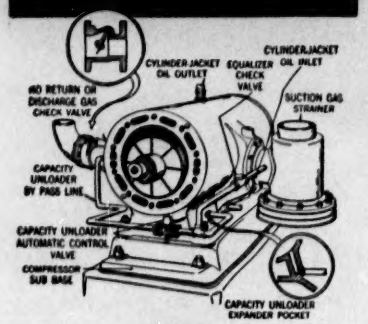
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Purposeful Purging

(Continued from Page 18)

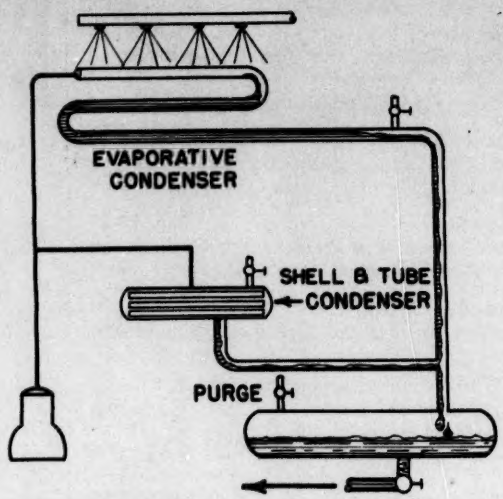


Fig. 7—When two condensers are operated in parallel without proper piping arrangment, the one having the greater internal resistance, such as the evaporative condenser in this diagram, will load up with liquid refrigerant and lose capacity. Fig. 8 is correct method.

Parallel Condenser Operation

No discussion of the purging problem would be complete without considering the case of two or more condensers operating in parallel. Fig. 7 shows a shell-and-tube condenser and an evaporative condenser in an arrangement that is likely to give trouble. The evaporative condenser has a definite internal pressure loss, while the shell-and-tube condenser has practically none. With both condensers in operation, liquid ammonia will back up in the evaporative condenser and greatly reduce its capacity.

Many engineers have experienced loss of condensing capacity with an evaporative condenser installed on the same level as a shell-and-tube condenser. But this can also happen if the evaporative condenser is installed a considerable distance above the shell-and-tube condenser. In such a case, however, the situation can be easily corrected as shown in Fig. 8 which is similar to Fig. 7 except that traps have been added at the bottom of the connections between the condensers and the receiver.

Trap To Balance

The trap on the evaporative condenser connection permits the liquid ammonia to build up a head in the vertical pipe (shown as "H" in the diagram) and this head counterbalances the pressure loss through the condenser tubes. The trap shown at the outlet of the shell-and-tube condenser may not always be necessary, but it is desirable under some operating conditions. The system shown in Fig. 9 will operate satisfactorily with either condenser working alone or with both on the line. Purge connections should be on both condensers and on the receiver.

An equalizer line can be used, as shown dotted in Fig. 8, and is desirable if the receiver is in a warm location. Note that this equalizer connects from the hot gas line to the receiver similar to the objectionable connection shown in Fig. 6. In this case, however, it does not cause bypassing of hot gas. The head of liquid "H" that accumulates above the trap in Fig. 8 overcomes the resistance through the condenser tubes and insures the flow of refrigerant from condenser to receiver. If the receiver is warmer than the condenser, vapor will flow from the receiver, through the equalizer, to the condenser where it will be condensed and thus prevent gas binding of the receiver. Under these conditions, noncondensibles will collect at the condenser outlet.

Trapping 'Vap-Condensers

When two evaporative condensers operate in parallel, it is also desirable to provide traps in the connections to the receiver as shown in Fig. 9. This is especially important if the condensers are of different size or different construction. Even if they are of identical size and construction, the

(Continued on Page 34)

(Continued From Page 19)

ing it impossible to purge from the receiver. Fig. 12 illustrates such a condition. Assumed is a system with a large receiver installed in the compressor room where the temperature is high. Further assumed is a gradually decreasing refrigeration load and constant water temperature to the condenser. Or, it could be assumed that there was a steady refrigeration load with constantly decreasing water temperature due to atmospheric changes.

In either case, the pressure in the condenser will drop. Just as soon as the condenser pressure drops, the liquid in the receiver will start to boil. And, the gas that has boiled off will mix with non-condensibles and migrate to the condenser counter current to the liquid, and also through the vent line. This condition of dropping condenser pressure could last over a period of several hours, and during this period air would be found in the condenser only.

Hydrogen Purging Caused By Cheap Ammonia?

One engineer mentioned that he had a purge connection at the top of his receiver so he could purge hydrogen gas manually. The hydrogen gas could enter the system if a poor grade of ammonia were used, or it could be due to break-down of the ammonia itself releasing hydrogen and nitrogen. If there is any reason to assume that non-condensibles separate out and air tends to drop to the bottom of a condenser because it is heavier than the refrigerant vapor, then it is equally logical to assume that the light hydrogen gas will collect at the top of the condenser.

If hydrogen is present in the system, a hydrogen gas purge point should be provided. However, be sure that the presence of hydrogen gas does not build up head pressure in excess of 150 psig. According to R. T. Brizzolara, refrigerant consultant, New York City, at pressures in excess of 150 lbs., hydrogen gas will enter back into solution in the anhydrous ammonia, making it impossible to be purged.

Until now, systems with just one condenser have been considered. Now examine systems with two or more condensers. Removing air from a refrigerant condenser is not unlike removal of air (and condensate) from steam-heated equipment. One of the fundamentals of good steam trapping practice is to put a steam trap on each individual unit. Fig. 13 shows, left, two unit heaters arranged in air flow series, drained by a single trap.

Both heaters are the same size, but the air temperature entering heater "A" at the left is much lower than that entering heater "B" at the right. More steam, therefore, is condensed in heater "A", resulting in a lower steam pressure inside of the heater. This causes a flow of steam from heater "B" drain line to heater "A".

As long as this steam flow continues, air cannot leave heater "A" counter-current to the incoming steam. Eventually, enough air accumulates in heater "A" so that the heat transfer rate is exactly equal to that of heater "B", but the capacity of heater "A" under these conditions is seriously reduced.

By installing a trap on each of the two heaters as shown on the right, each heater can operate at maximum efficiency regardless of steam pressure drop, and there is never any accumulation of air in either heater.

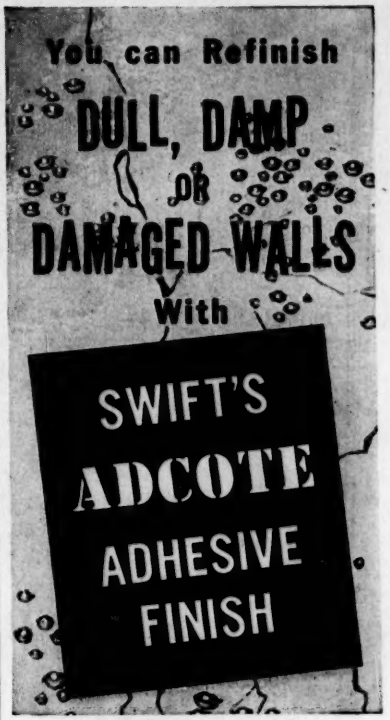
Multiple Unit Connections

Reasons for installing a steam trap on each steam-heated unit can well be applied to the purge connections for multiple condensers. It would be most surprising if the pressure drop in each condenser would be the same. There could be differences in the water flow to the multiple condensers, differences in the amount of surface, and differences in the condition of the surface. All of these making for unequal pressure drops.

Opinions regarding the purging of multiple condensers are varied. Charles A. Conley of Memphis, wrote: "Regardless of the type of condensers or how many of them, there is no need for a connection at the condenser". In the other corner, is Angus M. Casburg of Edinburg, Texas. Mr. Casburg has five vertical shell and tube condensers as shown in Fig. 14. He reports that "95 percent of the non-condensibles are purged from the top of the No. 1 condenser. The other four condensers never yield air for more than 1/2 hour each. The top of the receiver will yield for 1/2 hour, while the top of the No. 1 condenser will purge continuously for from one to three days".

If a man can get 100 percent efficient operation out of multiple condensers by purging from the receiver only, he is to be congratulated. He either has a remarkably good refrigerating system, or he has exceptionally competent operating engineers. However, as a purger manufacturer, the author's firm feels duty-bound to point out the hazards of condenser short circuiting and the probable need for a purge connection from each condenser.

(Continued on Page 35)



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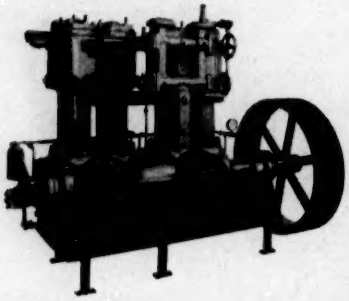

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Purposeful Purging

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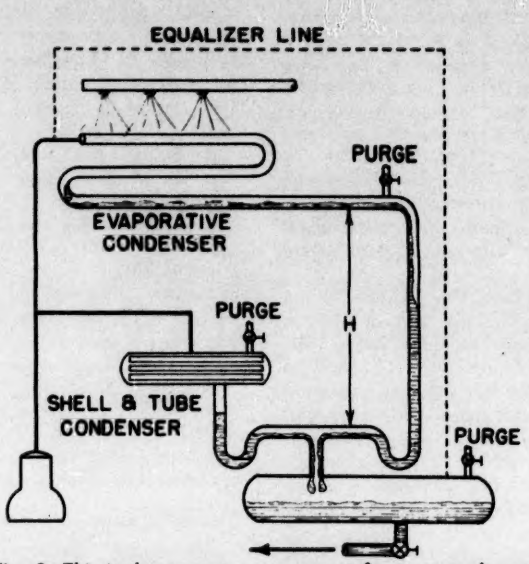

Fig. 8—This is the correct arrangement for two condensers operated in parallel. Head "H" above the trap must be greater than the internal resistance of the condenser. Note purge connections at both condensers and receiver. Equalizer line used for receiver in a warm location.

traps are desirable when one condenser may be operated without the other. Here again the equalizer line is shown dotted as an optional arrangement; a very desirable one if the receiver is in a warm location. As in the previous diagram, purge connections should be at both condensers and at the receiver.

It is quite evident that there is no one preferred place in an ammonia system for purging. An engineer won't go too far wrong, however, if he carefully analyzes just what goes on inside of the system, keeping in mind that the non-condensibles are always mixed with ammonia vapor and that they are always carried toward the coldest area of the high side. With evaporative condensers this will be either at the outlet of the condenser or at the receiver depending on whether the receiver is warmer or colder than the condenser.

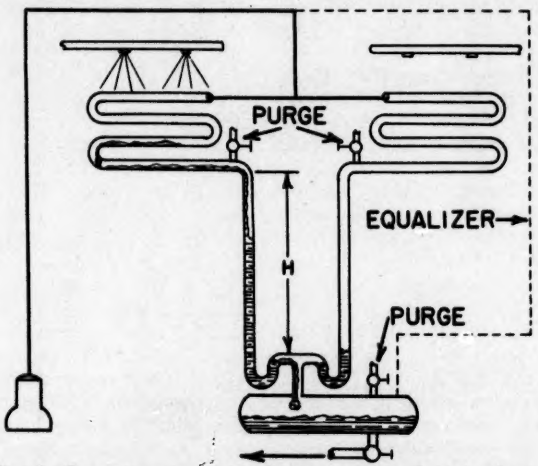

Fig. 9—Correct arrangement for two evaporative condensers. Either condenser can operate independent of the other. Head "H" above the trap, for either condenser, must be not less than the internal resistance of the condenser. Note purge connections at both condensers and the receiver.

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Purge Connections

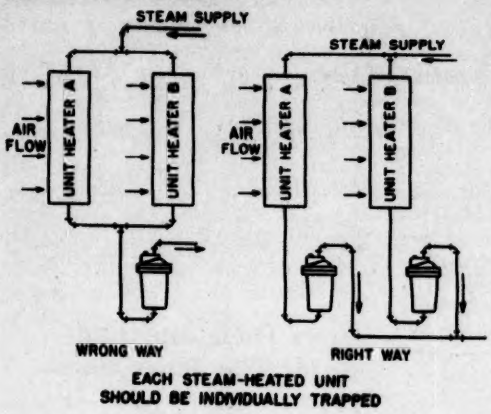

Fig. 13—Comparison of the wrong and right method for trapping steam heated series air flow units.

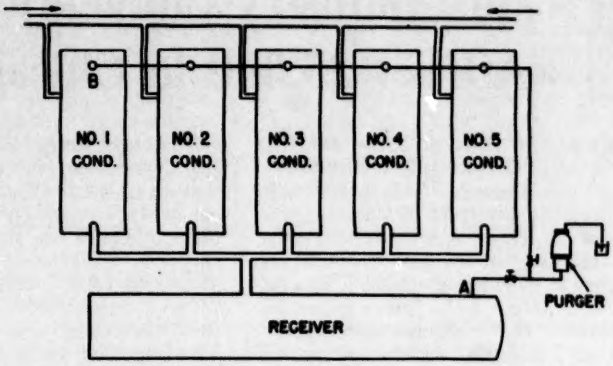

Fig. 14—Like steam units, multiple condensers require individual purge connections as shown at point "B".

Sizing Purge Lines

One correspondent emphasized the need for very generous-sized purge lines. Good-sized lines doubtless are required for equalizing, but the actual pipe size needed for hooking up an automatic purger is surprisingly small. Half-inch pipe is recommended for the purge connections; largely for strength and ruggedness.

A No. 370 Armstrong Purger will condense approximately 7 lbs. of ammonia as per hour. At 149 lbs. high side pressure, this gas occupies a volume of only 4 cu. ft., which would give a gas velocity of only 18 fpm in a 1/2-in. dia. schedule 40 pipe. This velocity is remarkably low. A number of years ago, an engineer installed successfully, an Armstrong Purger on a Refrigerant 12 system, using a pure line of 1/4-in. copper tubing.

With one condenser and one receiver and an adequate liquid line, good results are obtained with a properly-located receiver purge connection.

But, this will not purge hydrogen gas, and under conditions of falling condenser pressure, non-condensibles will migrate to condenser.

If liquid line from condenser is inadequate, provide purge connections from condenser and receiver.

Where multiple condensers are involved, unequal condenser pressure drops call for purge connections from each condenser.

How to Reduce Cooling Water Consumption with an ARMSTRONG PURGER

"Air" in your system increases head pressures and refrigerant temperature. It also reduces heat transfer efficiency. These add up to excessive cooling water consumption. If your head pressures are more than a couple of pounds above theoretical, your purging system is removing only part of the air. An Armstrong purger will remove *all* the air and thus cut your cooling water requirements.

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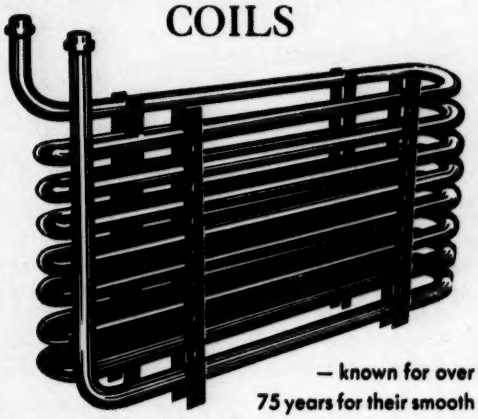

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Milk Industry Conventions Attract 25,000 in Chicago

▶▶▶CONCURRENTLY meeting in Chicago with the Dairy Industries Exposition, December 5 through the 12, were eight respective dairy organizations. Those conventions and the dairy show attracted some 25,000 persons in a period proclaimed by Chicago's Mayor, to be "Dairy Industries Week." The organizations were the Dairy Industries Supply Association, Dairy Suppliers Foundation, Dairy Society International, Milk Industry Foundation, National Association of Retail Ice Cream Manufacturers, National Ice Cream Mix Association, Evaporated Milk Association, International Association of Ice Cream Manufacturers and the American Butter Institute.

One featured speaker at the 51st Annual Convention in the Milk Industry Foundation was William A. McDonnell, President, U.S. Chamber of Commerce. McDonnell emphasized the part which the dairy industry could play to "save the free market", pointing out to those in attendance that the business community is possibly the only force at work in many instances against the further business controls or regimented economic system. He advocated less friction between small and large business, with business men uniting on legislative matters such as labor reform, excessive government spending, and exemptions from national wage hour laws.

Fewer Producers, Less Milk; More Consumption; Best Net

President of the Foundation, Hubert Garrecht, pointed out that the industry is approaching a greater stability, approximating a balance between milk production and consumption, as well as increased efficiency in processing, distribution and pricing. He pointed out a couple of facts to back up those statements: The number of dairy companies and cows are fewer, and production for 1958 was less than '57. However, there was an increase in the net income of dairy farmers and processors in spite of the fact that the total cash income was slightly lower. The consumption, however, is more with less milk products going to surplus. Surpluses were expected to amount to only three percent of the year's production, a 40 percent reduction over the previous marketing year.

The International Association of Ice Cream Manufacturers added variety to their array of presentations on production and food technology topics, through the appearance of a couple of speakers on materials handling and plant construction topics. G. A. M. Anderson, The King Company, Owatonna, Minnesota, presented a paper on the Use of Overhead Conveying Systems in Hardening Rooms. The presentation emphasized flexibility, additional storage space, reduction in the hardening time and decrease in the man hours where systems of this type are installed. Three specific installations were described with accompanying detailed diagrams of hardening rooms and freezing units.

Refrigeration Papers

Dr. C. W. Hall, Michigan State University, East Lansing, Michigan, described new material and concepts in plant construction. Minor plant modification in ice cream production were emphasized. An extremely valuable list was compiled by the author, cataloging new materials and supplies for walls, and floors, construction and coatings. Included in the compilation is the manufacturer, his address, product name and reference, and a description of the product; a very practical paper.

At these International Association of Ice Cream Manufacturers' sessions, Savings Through Safety was a presentation by Raymond C. Ellis, Jr., of the Food Beverage and Cold Storage Section, National Safety Council. Ellis presented a similar talk to the Chicago Section, NAPRE, the same week, excerpts of which are included in the article on page 22, this issue, INDUSTRIAL REFRIGERATION.

Other papers involving refrigeration were presented to the Milk Industry Foundation at their Plant Section program and Motor Vehicle Section activities. Robert Williams, M.S.U., East Lansing, discussed Refrigeration Losses Through Doors and Conveyor Passes. The panel presentation on the refrigeration of delivery vehicles discussed Holdover Plate Refrigeration vs. Blower Types. Another day's program covered Outside vs. Inside Vehicle Storage and new developments in truck design and materials. J. E. Hutchinson, Dole Refrigerating Company, Chicago, headed the holdover plate proponents, while E. E. Melby, Thermo King Corporation, led the discussion on blower types.

Refrigeration firms exhibiting at the Dairy Exposition were Armstrong Cork Co., Baltimore Air Coil Co., Inc., The Creamery Package Mfg. Co., Dole Refrigerating Co., The Dow Chemical Co., Freezing Equipment Sales, Inc., Jamison Cold Storage Door Co., The King Co., The King Zeero Co., Mojonnier Bros. Co., H. A. Phillips Co. and The Vilter Manufacturing Co.

News Odds and Ends From The Dairy Show

▶▶▶BEAUMONT, Texas will have a new half million dollar milk processing plant in 1959. Ground was broken in that city a week prior to the dairy show for a new Borden Company facility. The building will be one story, of colonial design and reported to cost $525,000.00. Involving 35,000 sq. ft., it will be located on the Freeway north of College Street. The present Borden facility will be sold when the new plant is completed.

The Borden Company general manager, John W. Luker, at Houston, Texas indicated to City and Chamber of Commerce officials at Beaumont that the new plant is one of 35 similar operations by Borden in the firm's southern district, which extends from Arizona to the Atlantic Seaboard.

Twenty Quarts Apiece

▶USED BY the International Association of Ice Cream Manufacturers in their monthly News Letter, the above heading emphasized the fact that 20 quarts of ice cream and other frozen dairy products were consumed per person in the 1957-58 marketing year. According to the National Dairy Council this is twice as much per person as the consumption prior to World War II. Also mentioned in the article was the fact that 60 pounds, almost 28 quarts, of whole milk is used to manufacture 20 quarts of ice cream.

Dairy-Bakery Firm To Consolidated Foods

▶LAWSON MILK CO., of Ohio, producer and distributor of dairy and bakery products, was acquired by Consolidated Foods Corp., for approximately $10 million dollars. Lawson Milk sales in its most recent fiscal year exceeded $24 million dollars, through nearly 175 retail outlets. Consolidated acquired this firm for a diversification, an officer of the company stated.

Australian Calves From U. S. Sires

▶ DISCUSSED by some dairymen at the Chicago meetings was the article in the New Jersey Agriculture Bulletin of September-October 1958, describing the use of U.S. frozen semen for producing Guernsey calves in Australia. The article is by John P. Mixner, a Professor in research, specializing in dairy science in New Jersey. The article emphasizes the section of the 5-year program in which the New Jersey Agricultural Experiment Station supply to Australian breeders has been proven by the calves produced.

Ice Cream Courses

▶ PENNSYLVANIA State University during the second week in December, sponsored a class in ice cream making. The 4-day course included information on the composition and properties of frozen desserts, ingredients used, the *principles of refrigeration*, flavoring, and freezing soft and hard frozen desserts, cleaning and sterilizing equipment, sanitary regulations.

Light Fingered Juveniles

▶ ON THE MORE humorous side many ice cream manufacturers and distributors were talking about the truck-car accident at Kansas City, Missouri, which caused the Police Department to make two separate and widely different reports. The first report was the routine accident report. The second covered theft, brought about when some 20 neighborhood children opened the door of the ice cream truck and helped themselves while the driver and police were preoccupied with the first report.

At least the neighborhood juveniles were not wasteful. Excuse for the raid appeared to be a presumption that the product would melt as a result of the accident.

New Northwest Plant

▶ DAIRY Cooperative Association, Portland, reported that a general contract had been let to build a milk plant at The Dalles. The project, previously bid in October, had been taken under revision and new bids requested. The scope of plans was reduced some to bring construction bids within the Coop budget.

Milwaukee Change

▶ A MILWAUKEE interest purchased the Tompkins Ice Cream Co., Milwaukee, a subsidiary of Velvet Freeze, Inc., St. Louis, Mo., late in 1958. The new corporation known as the Tompkins-Velvet Freeze Ice Cream Co., will operate the former firm's 18 Wisconsin stores. No purchase price was revealed. Of the 18 dairy stores, 14 are in the greater Milwaukee area.

Soft Ice Cream

▶ IN GREAT BRITAIN, it was learned that America's soft ice cream has taken hold. Vans, fitted with ice cream manufacturing equipment, cruise residential areas dispensing freshly made ice cream. The vehicles are built and equipped in England, but the process is licensed by an American firm.

Soft ice cream isn't the only dessert product booming in the United Kingdom. It was learned that T. Wall & Sons plan a fourth ice cream factory to be built at Gloucester. Construction is to begin shortly and the plant will be in production in 1960. An initial manufacturing capacity of 10,000 gallons of ice cream and fruit ices is expected to employ about 400 people. Adjoining it will be a large cold store for holding ice cream between truck distribution runs to depots in Southwest England, South Wales and Midlands.

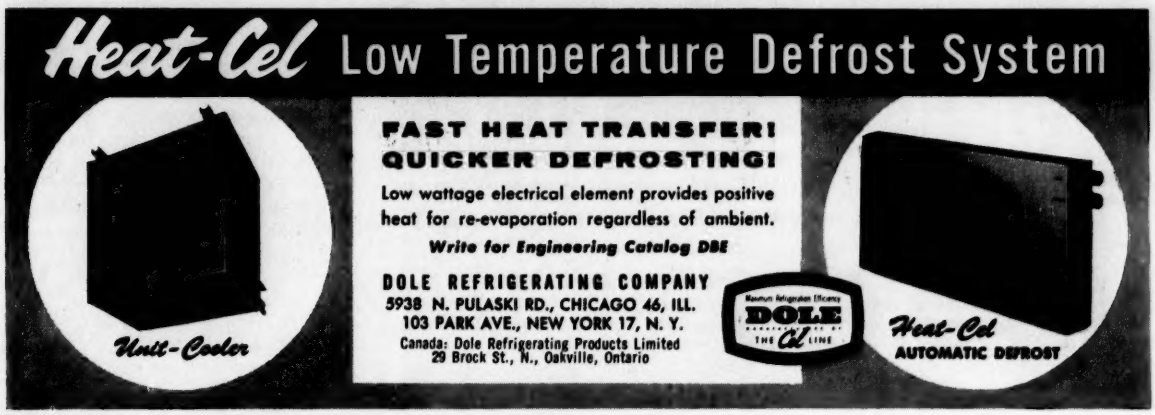
Ice Cream Abroad

▶ THE CHICAGO SHOW is an international one. Among some of the international news items overheard was the acceptance of American novelty ice cream products. Ice-cream-on-a-stick, long a favorite in the U.S., was featured at the Dairy Society International's return exhibit at the 1958 Zagreb International Trade Fair, and appeared to have become popular in Yugoslavia. The Society's chief-of-mission reported that popularity was instantaneous – with chocolate coated bars an odds-on favorite over fruit flavored coatings.

The educational exhibit under sponsorship of the Office of International Trade Fairs, USDC and DSI, was a single unit showing and did not, this time, feature the customary recombined milk, cheese samples and cups of ice cream which have been a trademark heretofore. The ice cream mix for the novelty bars, however, was recombined in the Zagreb Dairy from dry ingredients obtained through the USDA.

Africa-England Trade

▶ A 10-YEAR AGREEMENT on the marketing and distribution of Kenya Dairy Products in England was undertaken also late in 1958 by Kenya Cooperative Creameries, Ltd., and J. Lyons, Ltd., in London. The new company, a partnership of the two firms, will take over Penguin Dairies, Ltd., in Nairobi. As a result in the increasing interest in the import and export of frozen products, the British India Steam Navigation Co. have provided low temperature refrigeration space in their passenger vessels on the East Africa run. Kenya is exporting increasingly varied amounts of frozen products to the United Kingdom, while the British are exporting ice cream and pre-cooked frozen foods to the East Africa markets.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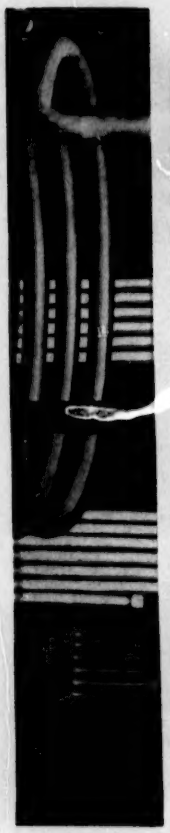
Ice Association Changes Its Name

▶▶▶ AT THE MEETING in Miami this past Mid-November, the National Association of Ice Industries, Inc. became NATIONAL ICE ASSOCIATION, INC. The change was one of those brought about by revision of the Association's by-laws, which were adopted unanimously at the opening session.

Another change was the method by which a member's dues were arrived at. Previously dues in the Association were based on tons of ice sold. Dues will now be based on the dollar ice sales, ranging upward from $25.00 for merchandisers below $10,000 sales volume. Dues to $100,000.00 sales volume is now a graduated scale to $200.00 annually. A similar graduated scale is applied up to one million dollar sales.

All officers of the National Ice Association were re-elected as announced under News Briefs in INDUSTRIAL REFRIGERATION, page 5, December 1958. For various ice meetings and activities in 1959, see page 31, this issue.



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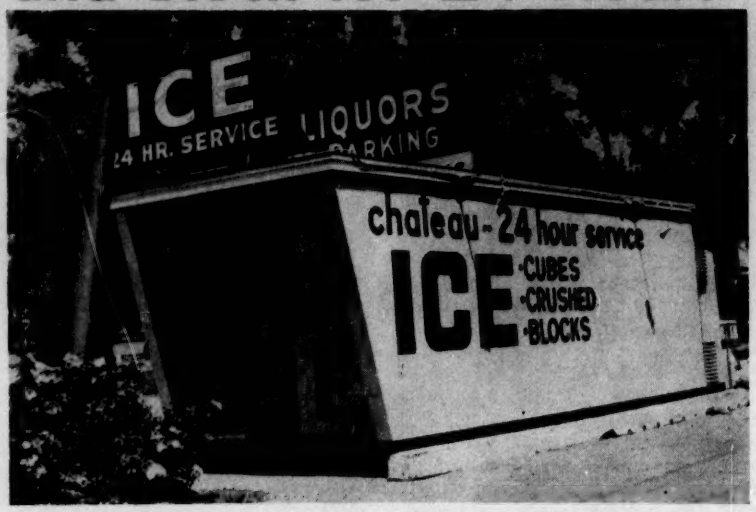

▶▶▶ "Parties don't stop at our closing time," according to Gordon Lee of Chateau Liquors in Denver, Colorado, "and the need for ice often continues into the wee small hours. Consequently, providing 24-hour-a-day ice service for our customers seemed to be an excellent way to create more good will, establish identification with a lot of new customers, and boost our overall sales."

After a little cogitation on the subject, package store owner Lee sold himself so thoroughly on its merits that he invested $7,000 for an unusual "round-the-clock ice service facilities". This, as pictured, is an 18 foot long ice vending station, finished in chartreuse which occupies the rear of Chateau Liquors asphalt-service parking lot and driveway. Convenient at any time of night or day, the big box was custom-built to Chateau Liquors specifications by a Fort Worth, Texas, contractor, and incorporates many of features which are now becoming more common in the vending picture.

For example, the machine vends all three—ice cubes, crushed ice, and ice blocks, according to the customer's choice, through three stainless steel apertures at the front. Enough capacity is contained within to fill 60 orders of each variety of ice, an amount well able to handle all customer needs even during the height of the summer social season when ice purchases are at the maximum.

To make things easy for the customer who gave no thought to the proper change, each of the vending mechanisms will accept any combination of coins up to 50 cents, so that 10 nickels, 5 dimes, 2 quarters, or any admixture of coins will produce the desired ice. With the average order selling at 35 cents, this means that usually enough change to operate the machine can be scraped up among members of a party, or among persons in a car.

To provide still more convenience, Lee has installed a pick-vending machine within the extended canopy which protects the operating space of the machine. Ice pick, vended at 25c apiece, will appeal to economy-minded customers who realize that a block of ice and an ice pick will cool many more drinks than 35 cents worth of ice cubes—and without much wastage.

Product Supplied By Ice Manufacturer

The big compartment space at the rear of the ice vending machine will accommodate enough reserve ice for a full day's operation, in addition to that loaded into the vending chutes, so that it will scarcely be necessary to send out a hurry up emergency call to Colorado Ice Co., which supplies Chateau Liquors' needs.

In operation for only a short time, the ice vending unit had proven a sensational success. As many as 35 "orders" for all three types of ice have been posted in a single night, and sales during daylight hours are even better. As anticipated, the majority of ice purchases comes long after closing hours, between midnight and 2 o'clock in the morning, when perturbed hostesses discover that there is no ice available from the family refrigerator.

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All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

Position and Help Wanted

REPRESENTATION WANTED
for broad line of industrial refrigeration equipment. Several territories having an excellent sales potential are available. Write to Imeco Incorporated, 3033 W. Belmont Ave., Chicago 18, Ill.

WANTED—Manufacturing Representative to sell ammonia valves. Sales representative should be handling compatible ammonia refrigeration products. Cyrus Shank Co., 4646 W. 12th Place, Chicago 50, Ill.

WANTED—Chief engineer and general superintendent for large cold storage fish freezing plant in foreign country. Must speak Spanish fluently and be able to handle help and business relations. State salary expected. Address BOX DC-9, c/o Industrial Refrigeration.

WANTED — Chief Engineer. Cold storage warehouse, eastern location; maintenance experience necessary. Salary range $6500 to $7500. Give experience, age and reference in first letter. Address Box JA-3, % Industrial Refrigeration.

AUTHORIZED SERVICE AGENCIES
wanted to handle installation and maintenance of top line liquid and air-cooled chillers. Franchised territories available now! Terrific opportunity to build your service business on a fast moving new product. For complete details call, wire, or write Dept. I.

VIC MANUFACTURING CO.
1313 Hawthorne Minneapolis 3, Minn.

USED EQUIPMENT—wanted & for sale

WANTED—Up to 400 11½x22½x58" Or 60" 400 lb. ice cans, in good condition. Duty Ice Co., 724 S. High St., Akron 11, Ohio.

FOR SALE—Complete WORTHINGTON refrigeration system, 1700 ton, fine condition, priced right, Midwest. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299.

WANTED TO BUY—4 cylinder Carrier type 7G8 "Freon" compressor. Write complete details to Pierce C. Rucker, P.O. Box 2971, Greensboro, N. Car.

REPOSSESSED EQUIPMENT
Worthington, Brunner, Bush, refrigeration and air conditioning equipment. 10, 20, 40 h.p. Compressors, condensers (air, water), motors, freezer blowers, F-12. All in good running order. No reasonable offer refused. Rockland Refrigeration Co., 127 Main St., Nyack, N.Y.

FOR SALE — SEE IN OPERATION
Complete cold storage engine room ammonia equipment including Frick 11½ x 8 — D.C. to 60 h.p., 400 r.p.m. Worthington 7 x 7 D.C. to 50 h.p., 400 r.p.m. Worthington horizontal high-low duplex d.c. to 100 h.p., 225 r.p.m. Vilter 10½ x 10½ belt drive by 100 h.p., 1750 r.p.m. Vilter 9½ x 7 belt drive by 30 h.p., 1200 r.p.m. All force feed lubricated; motors 220 volt 3 phase. MG sets, starters, panels spare parts included.
CENTRAL WAREHOUSE COMPANY
739 Pillsbury Ave. St. Paul, Minn.
Phone: MIdway 6-2831

FOR SALE
USED REFRIGERATION EQUIPMENT
6—Ammonia compressors: 3-30 ton, 1-40 ton, 1-tandem 115 ton; synchronous motors and automatic controls, 440 V., 3 phase, 60 cycle.
5—Brine pumps; 3-200 gpm, 2-250 gpm, 50' head.
4—water pumps; 2-200 gpm, 1-250 gpm, 1-1200 gpm, 60' head, 220-440 V., 1740 r.p.m.
4—brine coolers, horiz. shell and tube type.
4—ammonia condensers, vertical shell and tube type.
2—horiz. ammonia receiving tanks 26" dia. x 9'.
2—horiz. ammonia storage tanks 30" dia. x 17'.
72—20 in. fans, 2 blade, ½ h.p. motors, 220 V., 3450 r.p.m.
34—Bunker coil sets, 2" pipe, 4 to 12 wide, 4 high, length of coils 37' to 80', total 60,000' of pipe.
Cooling tower, ozone generator, 34 Bunker pans.
BIDS CLOSE FEB. 16th.
Complete data and bid forms on request.
CHIEF ENGINEER, S.F. PORT AUTHORITY
Ferry Building San Francisco, Calif.
Garfield 1-8800

USED EQUIPMENT—continued

FOR SALE—4x4 York compressor, with motor, all on one base. One 30" freezer door. Write E. Niebling, 1546 St. Clair, Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE
350 h.p. Carrier water chilling unit.
(2) 100 h.p. & (1) 75 h.p. brine chilling units.
(1) 9 cyl. & (2) 6 cyl. type AHP Frick "Eclipse" compressors.
9x9 York "Duplex" 200 h.p. compressors.
7½x7½ York & 7x7 Frick compressors.
7½ & 3½ ton Euclid cranes.
Complete ice making plants, 50 & 100 tons.
JOHN F. CARSON
A & Venango Sts., Philadelphia 34, Pa.
GArfield 6-2221

FOR SALE—1—6x6 & 2—3x3 used high speed York ammonia compressors; several square flanged York return bends on 6" centers; new 6½ & 6x6 main bearings for York machines. P.O. Box 1093, New Haven 4, Conn.

FOR SALE—Refrigeration equipment for various uses. Advise us your needs. Use "QUICKSEAL"-stops brine tank leaks. Use "CLERTEMPICE"-tempers ice.
Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299.

FOR SALE—One 13¼ x 9 Frick booster compressor complete with synchronous motor, drive. Excellent condition. R. H. Bosman & Bros. Inc. 1050 Granby St., Baltimore 2, Maryland.

FOR SALE — AMMONIA EQUIPMENT
3—15 ton complete Frick ice making plants, New, in crates. No air system, sold as used.
1—10"x10" 4 cyl. York duplex DC to 225 h.p. motor.
1—9"x9" 4 cyl. York duplex DC to 150 h.p. motor.
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1—9"x9" 2 cyl. Frick compressor.
1—7¾"x5" 2 cyl. Frick booster.
1—3"x3", 1—4"x4", 2—5"x5" condensing units. 3x3, 4x4, 5x5, 6x6 compressors.
11"x22"x51" 300 lb. ice cans, also 11"x22"x47" ice cans.
Ice Plants 25 to 100 tons, York & Frick.
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WANTED—Used Brewery Plant, complete; proper for city 200,000 people. One ice cubing machine. Describe fully. Gloen Co., P.O. Box 2513, New Orleans, La.

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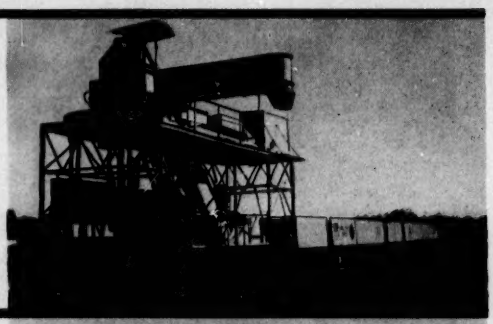
BRINGS YOU MAJOR SAVINGS

Great new improvements offered by Conveyco BUNKER ICING machines are producing tremendous savings in both initial installation and in operating costs for ice companies and railroads.

CONVEYCO machines with twin drum ice breakers reduce 300 lb. or 400 lb. blocks of ice to smaller bunker ice sizes with amazing uniformity and a minimum of wasteful fines. Fast two-man operation — one operator and helper — reduces costs. Write for complete money-saving story of "on-the-job performance" now.

RAIL MOUNTED ICER

A complete self-propelled unit that ices refrigerator cars from an adjoining track. Carries own ice supply. Eliminates breaking up of long trains to ice cars. Saves time and money.



TWIN DRUM DOCK ICER

A fast two-man machine with automatic salting unit that ices and salts bunkers simultaneously. Ice is delivered to both hatches of a bunker at same time. Requires lighter dock construction than any other comparable machine — also is faster and more efficient.

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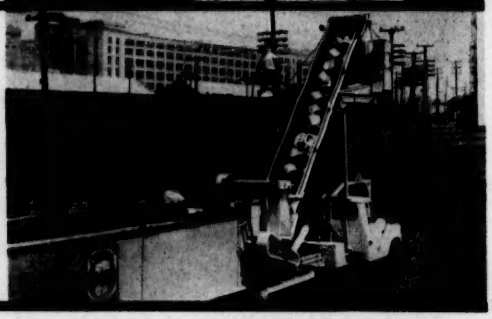
Speeds icing of cars located on sidings or in yards. Saves time of shuttling cars in and out of ice house docks. Also valuable where ice house is far from loading point. Used effectively for icing cold storage bunkers. Owners report savings of as much as 70%.



Put efficiency in your bunker icing operations and show profits with a Conveyco machine. ***Call or write for complete details today.***

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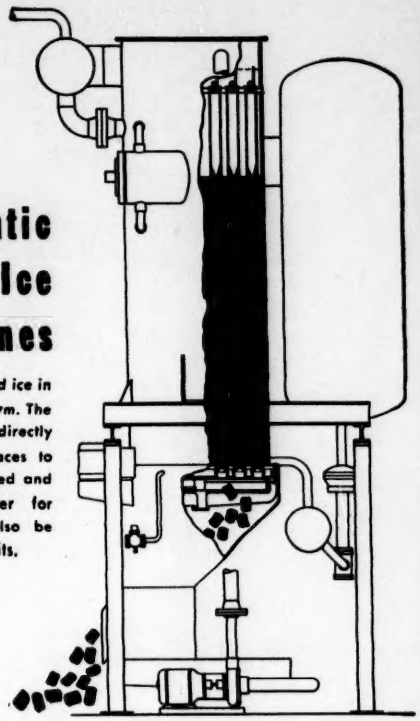
Make clear, hard, sized ice in cylinder or crushed form. The refrigerant is applied directly to the freezing surfaces to produce ice with speed and economy. Cold water for process work can also be supplied by these units.



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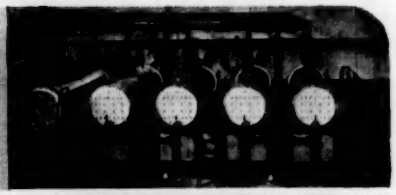
Refrigeration Condensers

Available in horizontal multipass shell and tube types and vertical single pass types for Ammonia or other refrigerants. Special metals, lined tubes, etc. can be furnished for unusual operating conditions.



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Multipass type brine coolers are ideal for closed brine systems in cold storage plants, dairies, packing plants, petroleum refineries, etc. requiring units of large capacity. Also suitable for cooling non-corrosive liquids in gr neral.

Scraped Surface Exchangers

Continuously revolving scrapers sweep heat transfer surfaces clean and keep solids in suspension. Useful in problems of heat transfer with crystallization with high viscosity, or with solvent extraction. Available in double pipe and shell and pipe construction.

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Look for these features on the finest freezer doors

. . . Jamison Vap-r-tyt® Lo-Temp Door has unmatched record of dependability and economy

VAP-R-TYT METAL CLADDING

All metal seams locked and soldered

Penetrating bolt holes sealed

Prevents penetration of moisture under high vapor pressure

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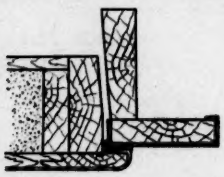
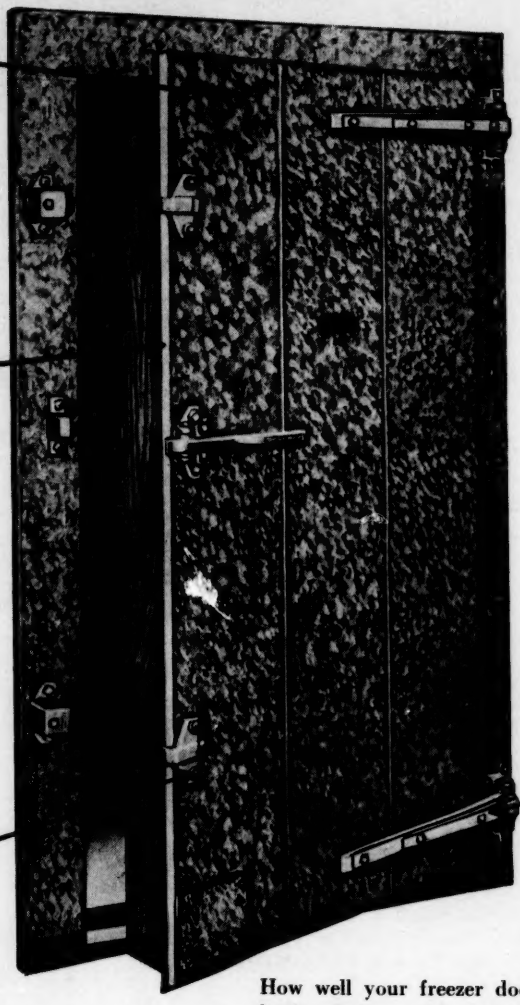


Requires less space than overlap type

Fits *into* wall

Requires shorter radius of swing

E-Z OPEN TWO-POINT FASTENER



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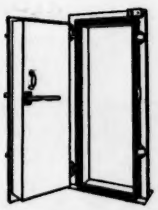
Keeps doors from freezing shut

Safe temperature range eliminates dangers of overheating or condensation

Permits selection of any temperature between 60°F and 120°F

Carries Underwriters' Laboratories Inc. label



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How well your freezer door performs depends on its basic design and construction. Jamison Lo-Temp Vap-r-tyt doors—proven through years of service in all types of installations — are today's economical answer to modern freezer operation. Write today for catalog Section 4 to Jamison Cold Storage Door Co., Hagerstown, Md.

JAMISON

COLD STORAGE DOORS